ROHDE&SCHWARZ

Broadcasting Division

Instrument Manual

R&S®SLx8000
ADTV Transmitter Family

Band III / IV / V, Low Power

Only skilled personnel may perform the operations of the described instrument that are necessary for installing and putting it into operation as well as maintaining, troubleshooting and servicing it.

Printed in Germany

Instrument Manual
Transmitter Series SLx8000
Edition: October 2007
Version: E 01.00

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81671 Munich, Germany

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Printed in Federal Republic of Germany ^ Subject to change ^ Data without tolerances: typical values

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KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE) Anhang V, zertifiziert durch die Benannte Stelle CETECOM ICT Services GmbH, Reg. Nr. Q812137N
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Zertifikat-Nr.: / Certificate No.: 2007-53, Seite 1 von 2 / Page 1 of 2

Hiermit wird bescheinigt, dass die Funkanlage
This is to certify that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000	**2100.1000.20**	**Kleinleistungssender 2HE, Grundgerät digital** Low Power Transmitter 2U, Basic Unit digital
SLX8000	**2100.1000.30**	**Kleinleistungssender 3HE, Grundgerät digital** Low Power Transmitter 3U, Basic Unit digital

Geräteklasse: / Equipment class: 2.10 (Broadcast transmitters)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.

- Gesundheit und Sicherheit gemäß § 3 (1) 1 (Artikel 3 (1) a))
- Health and safety requirements pursuant to § 3 (1) 1 (Article 3(1) a))
- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))
- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums
- Measures for the efficient use of the radio frequency spectrum
- Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2))
- Air interface of the radio systems pursuant to § 3(2) (Article 3(2))

Angewendete harmonisierte Normen: / Harmonized standards applied:
EN 60950-1 : 2001
ETSI EN 301 489-1 V1.5.1 (2004-11)
ETSI EN 301 489-14 V1.2.1 (2003-05)
ETSI EN 302 296 V1.1.1 (2005-01)

Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen):
Other means of proving conformity with the essential requirements (standards/specifications used):
ETSI EN 300 744 V1.5.1 (2004-11)
RegTP SSB RU 005
Rec. 1999/519/EG; 26. BImSchV

Anbringung des CE-Zeichens ab: 2007 / Affixing the EC conformity mark as from 2007

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München, den 22. August 2008
Munich, 2008-08-22

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Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000B9	**2100.4000.02**	**AC Netzteil 2HE /** AC Power Supply 2U
SLX8000B10	**2100.4022.02**	**DC Netzteil 2HE /** DC Power Supply 2U
SLX8000B11	**2100.4045.02**	**AC Netzteil 3HE /** AC Power Supply 3U
SLX8000B12	**2100.4068.02**	**DC Netzteil 3HE /** DC Power Supply 3U
SLX8000B13	**2100.3232.02**	**GPS-Empfängerkarte /** GPS Receiver Board
SLX8000B14	**2100.3355.10**	**Einbausatz für DVB-T/-H Sender-/Empfänger-Betrieb** Kit for DVB-T/-H Re-Transmitter Operation
SLX8000B15	**2100.3355.20**	**Einbausatz für DVB-T/-H Monitoring-Option** Kit for DVB-T/-H Monitoring Option
SLX8000B35	**2100.1252.02**	**VHF-Verstärker 25 W /** VHF Power Amplifier 25 W
SLX8000B36	**2100.1269.02**	**VHF-Verstärker 50 W /** VHF Power Amplifier 50 W
SLX8000B42	**2100.1169.02**	**UHF-Verstärker 2 W /** UHF Power Amplifier 2 W
SLX8000B43	**2100.1175.02**	**UHF-Verstärker 5 W /** UHF Power Amplifier 5 W
SLX8000B44	**2100.1181.02**	**UHF-Verstärker 10 W /** UHF Power Amplifier 10 W
SLX8000B45	**2100.1198.02**	**UHF-Verstärker 25 W /** UHF Power Amplifier 25 W
SLX8000B46	**2100.1200.02**	**UHF-Verstärker 50 W /** UHF Power Amplifier 50 W
SLX8000B47	**2100.1217.02**	**UHF-Verstärker 100 W /** UHF Power Amplifier 100 W

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Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000A	**2100.1000.21**	**Kleinleistungssender 2HE, Grundgerät analog/digital** Low Power Transmitter 2U, Basic Unit analogue/digital
SLX8000A	**2100.1000.31**	**Kleinleistungssender 3HE, Grundgerät analog/digital** Low Power Transmitter 3U, Basic Unit analogue/digital

Geräteklasse: / Equipment class: 2.10 (Broadcast transmitters)

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Angewendete harmonisierte Normen: / Harmonized standards applied:	EN 60950-1 : 2001 ETSI EN 301 489-1 V1.5.1 (2004-11) ETSI EN 301 489-14 V1.2.1 (2003-05) ETSI EN 202 296 V1.1.1 (2005-01) ETSI EN 302 297 V1.1.1 (2005-01)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen): Other means of proving conformity with the essential requirements (standards/specifications used):	ETSI EN 300 744 V1.5.1 (2004-11) RegTP SSB RU 003 RegTP SSB RU 005 Rec. 1999/519/EG; 26. BImSchV

Anbringung des CE-Zeichens ab: 2008 / Affixing the EC conformity mark as from 2008

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Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
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SLX8000B10	**2100.4022.02**	**DC Netzteil 2HE /** DC Power Supply 2U
SLX8000B11	**2100.4045.02**	**AC Netzteil 3HE /** AC Power Supply 3U
SLX8000B12	**2100.4068.02**	**DC Netzteil 3HE /** DC Power Supply 3U
SLX8000B13	**2100.3232.02**	**GPS-Empfängerkarte /** GPS Receiver Board
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SLX8000B15	**2100.3355.20**	**Einbausatz für DVB-T/-H Monitoring-Option** Kit for DVB-T/-H Monitoring Option
SLX8000B35	**2100.1252.02**	**VHF-Verstärker 25 W /** VHF Power Amplifier 25 W
SLX8000B36	**2100.1269.02**	**VHF-Verstärker 50 W /** VHF Power Amplifier 50 W
SLX8000B43	**2100.1175.02**	**UHF-Verstärker 5 W /** UHF Power Amplifier 5 W
SLX8000B44	**2100.1181.02**	**UHF-Verstärker 10 W /** UHF Power Amplifier 10 W
SLX8000B45	**2100.1198.02**	**UHF-Verstärker 25 W /** UHF Power Amplifier 25 W
SLX8000B46	**2100.1200.02**	**UHF-Verstärker 50 W /** UHF Power Amplifier 50 W
SLX8000B47	**2100.1217.02**	**UHF-Verstärker 100 W /** UHF Power Amplifier 100 W

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München, den 22. August 2008
Munich, 2008-08-22

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Zertifikat-Nr.: / Certificate No.: 2008-50

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Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000B16	**2100.3455.02**	**Parallel-Fernschnittstelle** Parallel Interface

Geräteklasse: / Equipment class: 1.4 (Wired data equipment)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
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- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))

Angewendete harmonisierte Normen: Harmonized standards applied:	EN 60950-1 : 2003 ETSI EN 301489-1 V1.6.1 (2005-09) ETSI EN 301489-11 V1.3.1 (2006-02) ETSI EN 301489-14 V1.2.1 (2003-05)
Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen): Other means of proving conformity with the essential requirements (standards/specifications used):	---

Anbringung des CE-Zeichens ab: 2008 / Affixing the EC conformity mark as from 2008

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Mühldorfstr. 15, D-81671 München

München, den 25. Juli 2008
Munich, 2008-07-25

Zentrales Qualitätsmanagement MF-QZ / Radde
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Transmitter name	SLV8002	SLV8005	SLV8010	SLV8025	SLV8050	SLW8025	SLW8050	SLV8100	SLV8005A	SLV8010A	SLV8025A	SLV8050A	SLW8025A	SLW8050A	SLV8100A
Comment	2 Watt UHF only digital TV	5 Watt UHF only digital TV	10 Watt UHF only digital TV	25 Watt UHF only digital TV	50 Watt UHF only digital TV	25 Watt VHF only digital TV	50 Watt VHF only digital TV	100 Watt UHF only digital TV	5 Watt UHF analog or digital TV	10 Watt UHF analog or digital TV	25 Watt UHF analog or digital TV	50 Watt UHF analog or digital TV	25 Watt VHF analog or digital TV	50 Watt VHF analog or digital TV	100 Watt UHF analog or digital TV
Power DVB-T/-H [W]	2	5	10	25	50	25	50	100	5	10	25	50	25	50	100
Power ATSC [W]	3	8	16	40	80	40	80	150	8	16	40	80	40	80	150
Power Analog TV [W]	—	—	—	—	—	—	—	—	12.5	25	62.5	125	62.5	125	250
„Basic device" [1] SLX8000(A)	*2100.1000.20*	*2100.1000.20*	*2100.1000.20*	*2100.1000.30*	*2100.1000.30*	*2100.1000.30*	*2100.1000.30*	*2100.1000.30*	*2100.1000.21*	*2100.1000.21*	*2100.1000.31*	*2100.1000.31*	*2100.1000.31*	*2100.1000.31*	*2100.1000.31*
K-MAT Number	*2100.1000K20*	*2100.1000K20*	*2100.1000K20*	*2100.1000K30*	*2100.1000K30*	*2100.1000K30*	*2100.1000K30*	*2100.1000K30*	*2100.1000K21*	*2100.1000K21*	*2100.1000K31*	*2100.1000K31*	*2100.1000K31*	*2100.1000K31*	*2100.1000K31*
Amplifiers															
SLX8000B42	x														
SLX8000B43		x							x						
SLX8000B44			x							x					
SLX8000B45				x							x				
SLX8000B46					x							x			
SLX8000B35						x							x		
SLX8000B36							x							x	
SLX8000B37															
SLX8000B38															
SLX8000B47								x							x
Power supplies															
SLX8000B8															
SLX8000B9	x	x	x						x	x					
SLX8000B10	x	x	x						x	x					
SLX8000B11				x	x	x	x	x			x	x	x	x	x
SLX8000B12				x	x	x	x	x			x	x	x	x	x
Internal GPS															
SLX8000B13 (2100.3232.02)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
DVB-T/H Rx															
SLX8000B14 (2100.3355.10)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Potential free contacts															
SLX8000B16 (2100.3455.02)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Air filter															
SLX8000B22 (2100.3803.02)	x	x	x						x	x					
SLX8000B23 (2100.3803.03)				x	x	x	x	x			x	x	x	x	x

Hinweis zu den Kleinleistungssendern SLx8000:

Die Kleinleistungsfamilie SLx8000 erhält zwei neue Mitglieder, die für den Betrieb mit DTV- und Analog-TV geeignet sind:

SLV8005A mit 12 W Sync Peak Power Analog TV-Leistung
SLV8010A mit 25 W Sync Peak Power Analog TV-Leistung

Die DTV-Leistungen entsprechen denen der Sender SLV8005 und SLV8010 im Handbuch.

Note regarding the SLX8000 low-power transmitter:

The family SLX8000 of low power transmitters has two new members which are able to transmit DTV and Analog TV standards:

SLV8005A with 12 W Sync peak power Analog TV power
SLV8010A with 25 W Sync peak power Analog TV power

The DTV powers are the same as for the SLV8005 and SLV8010. Their standard dependet output power can be found in the user manual.

Printed in Germany

ACHTUNG:

Am RF-Ausgang dürfen nur doppelt geschirmte Kabel verwendet werden!

CAUTION:

A double shielded cable must be used on the RF output.

Printed in Germany

Manual Amendments: New DVB-T/H Receiver and Monitor Options

These supplements expand the manual for the SLx8000 transmitter family with details of the DVB-T/H receiver (re-transmitter) and monitor hardware options.

DVB-T/H receiver (re-transmitter) option

Chapter 2: Design and Function

2.5.3 DVB-T/H Receiver

With the SLX8000B14 internal DVB-T/H receiver, the SLX8000 becomes a re-transmitter. The DVB-T/H receiver board demodulates the RF input signal (fed to instrument socket X1) and delivers a transport stream that the exciter in the SLx8000 can again encode and transmit.

Chapter 3: Specifications

DVB-T/H data sheet – SLX8000B14 receiver

Frequency range	174 MHz to 255MHz, and 470 MHz to 862 MHz
Input sensitivity	–80 dBm to 20 dBm (using the step attenuator on the **TV Settings -> Input -> Receiver X1 -> Setup -> RF Attenuation Antenna** module)

Chapter 4: Startup

Information:
The **TV Settings > Input > TS1(HP)** and **TV Settings > Input > TS2(LP)** menu items described in earlier versions of the manual can now be found in the **TV Settings -> Input -> Input Config** menu item.

Before the re-transmitter is started up, the DVB-T/H receiver module must be configured.

The following settings are needed for this purpose:

In the **TV Settings -> Input -> Input Config** menu, set the **Source 1** menu item to **Rx**. This action selects the transport stream output of the receiver module as the source for further signal processing.

In addition, transport stream signals currently in use must be connected to instrument socket X22 (TS 2), since TS 1 is used by the internal receiver board.

- Select the receive frequency from the **TV Settings -> Input -> Receiver X1 -> Setup** menu.
- Select the channel bandwidth from the **TV Settings -> Input -> Receiver X1 -> Setup** menu.
- In the **TV Settings -> Input -> Receiver X1 -> Setup** menu, choose the input attenuation from the **RF Attenuation Antenna** field so that in the **TV Settings**

-> Input -> Receiver X1 -> Setup menu, the **Estimated SNR** field displays the highest possible value (consistent with the operating environment).

If an antenna signal is connected to instrument socket X1, the status display in the **TV Settings -> Input -> Receiver X1 -> Setup** menu should then show **OK** in the **Rx OK** field.

The DVB-T/H receiver / re-transmitter is then ready for use.

Chapter 5: Operation

5.1 Input Parameters: TV Settings > Input Menu

The menu windows in the **TV Settings** > **Input** menu are used to set the parameters for signal processing in the ADTV coder.

The **TV Settings** > **Input** menu leads to the following menu windows and menu paths:

- **Input Config** (DTV only): The transport stream interfaces for TS 1 and TS 2 (display of data format, packet length and data rate together with the choice of inputs)
- **Receiver X1** (DVB-T/H only, for installed option SLX8000B14: DVB-T/H receiver): Parameter assignment for the DVB-T/H receiver module
- **Input Automatic** (DTV only): Used to preselect the operating input, configure the automatic input switchover and set the behavior in the event of failure of the input signal
- **VF** (ATV only): Used to set the video input
- **Sound** (ATV only): Used to set the audio inputs

5.1 TV Settings > Input > Input Config

Setting item	Description
Source 1	For setting the signal source for **TS 1** The options are: – BNC : The transport stream is on instrument socket X21 (TS1) – RX : The transport stream comes from the DVB-T/H receiver
TS Format 1	Used to set the data format for the data stream at input **TS 1** The options are: – AUTO: The data format is automatically detected – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream
Source 2	For setting the signal source for **TS 2** The options are: – BNC : The transport stream is on socket X22 (TS2) – RX : The transport stream comes from the DVB-T/H receiver

TS Format 2	Used to set the data format for the data stream at input **TS 2** The options are: – AUTO: The data format is automatically detected – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream

Display	**Description**
Active TS Format 1	Displays the data format detected or set at input **TS 1**: – ASI: As described – SMPTE: As described – Auto: Auto has been selected and no data stream is present
Packet Length 1	Displays the packet length detected at input **TS 1**
Measured Data Rate 1	Displays the *data rate measured* at input **TS 1** without null packets Display in bits per second (bps)
Required Data Rate 1	Display for checking the measured data rate. The *maximum data processing rate* is displayed. Displayed in bits per second (bps)
Active TS Format 2	Displays the data format detected or set at input **TS 2**: – ASI: As described – SMPTE: As described – Auto: Auto has been selected and no data stream is present
Packet Length 2	Displays the packet length detected at input **TS 2**
Measured Data Rate 2	Displays the *data rate measured* at input **TS 2** without null packets Display in bits per second (bps)
Required Data Rate 2	Display for checking the measured data rate. The *maximum data processing rate* is displayed. Displayed in bits per second (bps)

5.2 TV Settings -> Input -> Receiver X1

This menu contains submenus for assigning parameters to the DVB-T/H receiver module and querying its status.

The TV Settings -> Input -> Receiver X1 menu leads to the following menu windows and menu paths:

- **Setup**: For assigning parameters to the receiver module
- **TPS**: Displays the DVB-T/H coding parameters (Code Rate, Guard Interval, FFT Length, etc.) detected by the DVB-T/H receiver
- **Status**: Displays the measured values (BER, PER, SNR, etc.) determined by the DVB-T/H receiver

5.2.1 TV Settings -> Input -> Receiver X1 -> Setup

Setting item	Description
RF Frequency	Center frequency of the DVB-T/H signal fed to instrument socket X1.
Bandwidth	Channel bandwidth (6 / 7 / 8 MHz)
RF Attenuation Antenna	Manual input attenuation (0 dB to 31 dB). This value should be adapted to suit the expected input level.
BER Threshold	Fault threshold for the bit error ratio (measured after the Viterbi decoder)
PER Threshold	Fault threshold for the packet error rate.

Display	Description
Rx OK	Displays the status of the DVB-T/H receiver. **W** : Warning -> Receiver has no valid input signal **OK** : Receiver has a valid input signal

5.2.2 TV Settings -> Input -> Receiver X1 -> TPS

If the receiver in the **TV Settings -> Input -> Receiver X1 -> Setup** menu displays **OK** in the **Rx OK** field, the DVB-T/H parameters it determined are listed here and are valid.

5.2.3 TV Settings -> Input -> Receiver X1 -> Status

Displays measured values.

Display	Description
Synchronized	Shows whether the DVB-T/H receiver was able to synchronize with the externally fed DVB-T/H signal.
Estimated S/N	The estimated S/N ratio at the receiver input. The maximum display value is approx. 24 dB. Even if the actual S/N ratio is better.
BER before Viterbi	Bit error rate before the Viterbi decoder.
BER after Viterbi	Bit error rate after the Viterbi decoder.
PER	Packet error ratio.
IF AGC Input	Status information about the receiver module's automatic gain control.
RF Input Level	RF input level in dBuV
Gain Input	Status information about the receiver module's automatic gain control.

Option: DVB-T/H monitoring

Chapter 2: Design and Function

2.1 Connectors

X3 : Receiver_Aux : Antenna input for external monitoring of DVB-T/H signals. Requires option SLX8000B15 (DVB-T/H monitoring receiver)

2.5.4 DVB-T/H Monitor

The SLX8000B15 hardware option monitors the quality of the RF signal transmitted by the SLx8000. To do this, it either internally taps the internal signal from the amplifier (source = **Amplifier**) or monitors the RF signal applied to instrument socket X3 (source = **Antenna**).

Chapter 3: Specifications

DVB-T/H data sheet – SLX8000B14 monitor

Frequency range	174 MHz to 255 MHz, and 470 MHz to 862 MHz
Input sensitivity	–80 dBm to 20 dBm (using the step attenuator on the **TV Settings -> DVB -> Monitor X3 -> Setup RF Attenuation Antenna** module)

Chapter 4: Startup

Before the DVB-T/H monitoring module is started up, the option must be configured. The following settings are needed for this purpose:

- Select the source that you wish to monitor (**Antenna** or **Amplifier**), from the **TV Settings -> DVB -> Monitor X3 -> Setup** menu
- Select the receive frequency from the **TV Settings -> DVB -> Monitor X3 -> Setup** menu
- Select the channel bandwidth from the **TV Settings -> DVB -> Monitor X3 -> Setup** menu
- In the **TV Settings -> DVB -> Monitor X3 -> Setup** menu, choose the input attenuation from the **RF Attenuation Antenna** field so that in the **TV Settings -> DVB -> Monitor X3 -> Setup** menu, the **Estimated SNR** field displays the highest possible value (consistent with the operating environment).

Information:
The **RF Attenuation Antenna** field is only used when monitoring the antenna input.

If the monitoring board is set to "Antenna" and a correct DVB-T/H signal is connected to instrument socket X3, the status display in the **TV Settings -> DVB -> Monitor X3 -> Setup** menu then shows **OK** in the **Rx OK** field.

If the monitoring board is set to "Amplifier" and the amplifier is delivering a correct DVB-T/H signal, the status display in the **TV Settings -> DVB -> Monitor X3 -> Setup** menu then shows **OK** in the **Rx OK** field.

The DVB-T/H – monitor is then ready for use.

Chapter 5: Operation

7.5 TV Settings -> DVB -> Monitor X3

This menu contains submenus for assigning parameters to the DVB-T/H monitoring module and querying its status.

The **TV Settings** -> **DVB** -> **Monitor X3** menu leads to the following menu windows and menu paths:

- **Setup**: For assigning parameters to the monitoring module
- **TPS**: Displays the DVB-T/H coding parameters (Code Rate, Guard Interval, FFT Length, etc.) detected by the DVB-T/H monitor
- **Status**: Displays the measured values (BER, PER, SNR, etc.) determined by the DVB-T/H monitoring module

7.5.1 TV Settings -> DVB -> Monitor X3 -> Setup

Setting item	Description
Input	For selecting the signal to be monitored. The options are: – **Antenna** : Monitor the signal on instrument socket X3 – **Amplifier**: Monitor the internally tapped signal on the output from the amplifier
RF Frequency	If the Input switch is set to **Antenna**, the center frequency of the DVB-T/H signal feeding into instrument socket X3 must be set here. If the Input switch is set to **Amplifier**, the software automatically enters the present transmission frequency of the amplifier here.
Bandwidth	Channel bandwidth (6 / 7 / 8 MHz)
RF Attenuation Antenna	Manual input attenuation (0dB to 31 dB). This value should be adapted to suit the expected input level.
BER Threshold	Fault threshold for the bit error ratio (measured after the Viterbi decoder)
PER Threshold	Fault threshold for the packet error ratio.

Display	Description
Rx OK	Displays the status of the DVB-T/H monitor module. W : Warning -> Monitor module has no valid input signal OK : Monitor module has a valid input signal

7.5.2 TV Settings -> DVB -> Monitor X3 -> TPS

If the monitor module in the **TV Settings -> DVB -> Monitor X3 -> Setup** menu displays **OK** in the **Rx OK** field, the DVB-T/H parameters it determined are listed here and are valid.

7.5.3 TV Settings -> DVB -> Monitor X3 -> Status

Displays measured values.

Display	Description
Synchronized	Shows whether the DVB-T/H monitor was able to synchronize with the DVB-T/H signal feed.
Estimated S/N	The estimated S/N at the monitor board input. The maximum display value is approx. 24 dB,even if the actual S/N is better.
BER before Viterbi	Bit error ratio before the Viterbi decoder.
BER after Viterbi	Bit error ratio after the Viterbi decoder.
PER	Packet error ratio.
IF AGC Input	Status information about the monitor module's automatic gain control.
RF Input Level	RF input level in dBuV
Gain Input	Status information about the monitor module's automatic gain control.

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CHAPTER 1

SAFETY INSTRUCTIONS

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1 About this Manual

This manual is part of the documentation for the NX8000 family of transmitters from Rohde & Schwarz. Each transmitter and each transmitter component is described in a separate manual. The individual manuals of the family of transmitters are modular in structure and complement each other.

Structure

Each transmitter component is described in a separate manual and can thus be used as an individual component (where practical). The transmitter manual is the main document for the entire set of documentation. It describes all steps that are necessary to install a transmitter, put it into operation, operate and maintain it. Where applicable, the transmitter manual refers to the individual manuals for the various components. The component manuals, in turn, also refer to the transmitter manual whenever the component is to be used as a transmitter module.

Contents

The manuals for the family of transmitters describe all steps required to install the transmitter or one of its components, put them into operation, operate and maintain them, troubleshoot and service them. The Annex includes interface descriptions plus technical documents.

For convenience, all manuals are structured identically. Sections that are not relevant to the manual at hand are also included but are left blank.

Safety

All skilled personnel working with a transmitter or its components must read all relevant manuals and comply with the safety measures that are detailed in the chapter about safety and in the applicable sections in the manual. The transmitter and the individual transmitter components must be used only for their intended purpose. All operations involving the transmitter or individual transmitter components must be performed by skilled personnel. The manual will point out specifically if additional qualifications are required.

Symbols and Layout

The triangular warning symbol indicates danger. In addition to the triangular warning symbol, different key words indicate the level of potential danger.

Instructions are given in numbered steps or indicated by an "index finger" symbol to the left of the instruction text. The results of the performed instructions are indented.

The key word "Note" precedes notes. Notes contain additional information and tips to help facilitate the work at hand.

All other formatting options add structure to the text and are self-explanatory.

2 Safety Instructions for Transmitter Systems and Instruments

ATTENTION!
The safety instructions provided in this manual must be complied with!

Pay special attention to the following points:

- Only skilled personnel may perform electrical installation and electrical connection tasks.
- Always follow the relevant national and international safety rules and regulations when equipping operating areas and when setting up and operating electrical equipment.

  These rules and regulations include for example:
  - Protective measures to prevent accidents
  - Protective measures to prevent overvoltage
  - Insulation status of electrical equipment
  - Grounding of electrical equipment
  - Physical properties and laying of electric lines and cables
  - Regulations applying to industrial premises and areas as well as to special facilities.

- When setting up the rack, observe the country-specific rules for accident prevention, for example with regard to:
  - Risk of getting crushed when working with loads suspended in the air
  - Risk of falling off ladders
  - Risk of injury when lifting heavy objects.

- Use your personal protective equipment for installation and repair work, i.e. wear protective clothing such as helmets, safety gloves and eye protection, depending on the task at hand.
- Operate the equipment and systems only when the cabinet is closed. If you have to open the cabinet for maintenance and repair work, comply with the applicable safety instructions.
- If the equipment and systems are removed from the AC power supply, all poles must be disconnected. Check for and remove any external power supply, i.e. all measuring cables, extension cables, multiple socket outlets (except for special service sockets). Wait for five minutes to ensure that any and all capacitors are sufficiently discharged.
- Additionally with liquid-cooled transmitters:When filling and installing the cooling system (pump unit and heat-exchanger unit), observe the rules for handling hazardous substances (cooling agents); see section "safety data sheets about hazardous substances" under "EU safety data sheet in accordance with 2001/58/EC Antifrogen".

3 General Safety Instructions

This section contains general safety instructions that apply to all products manufactured or distributed by Rohde & Schwarz.

In accordance with IEC 215 and EN 60215, transmitters and their auxiliary equipment must be operated only under the responsibility of skilled personnel. The EN 60215 standard ("Safety requirements for radio transmitting equipment") defines the minimum requirements for skilled electrical personnel.

Complying with all statutory provisions is a precondition for operating radiocommunications systems and equipment. The operator or the operator's authorized representative is responsible for ensuring compliance with these guidelines. They must also ensure that the operating personnel meets the applicable country-specific training requirements. These requirements also include any periodic training that is necessary.

4 Special Danger Warnings

4.1 Hazards due to AC Supply Voltage

There is a risk of electric shock with any V_{rms} > 30 V AC or V > 60 V DC voltage. Appropriate measures must be taken to prevent exposure to any danger when working with voltages that bear the risk of electric shock. Never work on live parts unless specifically required and only if the special safety precautions are complied with.

4.1.1 AC Power Supply

- Before connecting the equipment to the AC power supply, make sure that the AC supply data specified on the system or equipment matches the rated data of the local AC supply. The supply circuit must be protected by fuses against overloading and short circuits at all times.

4.1.2 Replacing Fuses

- Replace the safety fuses accessible in the operator area only if no voltage is being applied to the instruments. The safety fuses may be replaced only by fuses with identical electric data, identical switching characteristics and identical switch-off capacity.
- Motor and line circuit breakers accessible in the transmitter's operator area may be operated. If their response range is selectable, do not change the settings made by the manufacturer. If the settings are accidentally changed, reset them by using the correct values specified in this documentation.

4.2 Hazards due to High-Energy Circuits

The instruments include low-voltage circuits which can be fed from an extremely low-impedance voltage source (e.g. amplifier operating voltage). These circuits conduct dangerously large amounts of energy. We handle these circuits in the same manner as circuits with voltages that bear the risk of electric shock. They are usually covered and thus protected against accidental contact. The cover comes with a warning label.

Practical experience has repeatedly shown that a short circuit caused by metal tools can cause severe burns. For safety reasons, high-energy circuits are protected by covers and are thus not accessible within the operator area of the instruments.

- If you need to measure low-impedance voltages, during repair work for example, exercise the same caution as when measuring operating voltages that bear the risk of electric shock.

  Wear protective clothing if necessary.
- Before you open an instrument or remove its cover, switch off the operating voltage and wait for five minutes to ensure that any and all capacitors are sufficiently discharged.
- Do not short-circuit capacitors to discharge them.

4.3 RF Hazards

4.3.1 Mandatory Training

- Operators must instruct their personnel on how to use this transmitter or instrument in accordance with EN 60215 and IEC 215. This periodic training must cover the radio-frequency hazards of the individual transmitter or instrument. Only after such training has been provided and documented may the operating personnel handle switching and operating tasks.

High-energy RF circuits within the transmitter or the instrument are routed via conventional detachable RF connectors (e.g. N). Depending on the output power, the transmitter or instrument outputs come with screw-in or pluggable RF lines or ducts.

If RF lines or modules conduct high power, the connection point or the entire module is marked with the standard warning symbol (yellow triangle with black exclamation mark).

4.3.2 RF Shielding

Transmitters and instruments from Rohde & Schwarz are shielded in such a manner that RF radiation does not pose any danger even in the immediate vicinity if all RF lines are closed. This statement is based on the ordinance for electromagnetic fields as defined in German law:

The 26th ordinance for the Federal Emission Protection Law dated December 16, 1996 defines limit values for radio-frequency equipment for electric and magnetic field strengths.

4.3.3 Rules for Operating an Amplifier

Opening RF lines during operation may cause electric arcs. This can cause burns and eye injuries.

- Operate the amplifier only if an antenna or dummy antenna is connected.
- Never undo RF lines during amplifier operation.
- Never open amplifiers or modules during amplifier operation.
- Never put amplifiers into operation if RF lines are open.

4.3.4 Rules for Working with an Open Amplifier

Operating the instrument with RF power is not permitted if the instrument has been opened or its covers removed.

4.4 Hazards due to Beryllium Oxide (BeO) Ceramics

Note *Instruments and modules with components containing beryllium oxide (BeO) ceramics are marked accordingly. The following applies:*

If handled correctly, parts or components containing BeO ceramics are not hazardous to health.

If used improperly, however, BeO dust may be released. BeO dust causes chronic lung disease (berylliosis); inhaling large amounts over an extended period of time is toxic, causing respiratory paralysis and death.

4.4.1 Rules for Handling BeO Ceramics

- Parts or components containing BeO ceramics must not be opened, mechanically processed or destroyed.
- Above all, these parts or components must not be scratched, broken, ground, tempered and sandblasted, not even under exhaust hoods.

4.4.2 Marking Parts or Components Containing BeO Ceramics

Rohde & Schwarz marks all parts or components containing BeO ceramics in the electric parts list, the circuit diagram and the transmitter.

The *electric parts list* contains the following text:

Beryllium oxide	Hinweise beachten	Observe instructions

The *circuit diagram* includes the full warning:

Achtung!
Hinweise zur Sicherheit beim Umgang mit Teilen aus Berylliumoxid-Keramik beachten!
Attention!
Observe safety instructions for handling parts made from beryllium oxide ceramics!

In the *transmitter,* all components containing parts made from beryllium oxide ceramics are marked with a warning symbol and a label:

BERYLLIUMOXID / BERYLLIUM OXIDE

Sicherheitshinweise beachten Observe safety instructions

4.4.3 Measures in Case of Breakage and Waste Disposal

If BeO dust has been caused by breakage or other mechanical or electrical destruction, wipe away the dust using moist cloths and seal them in plastic bags together with the broken pieces. Wear protective gloves.

Mark the bags with the danger symbol and text:

Skull and crossbones danger symbol

Berylliumoxid-Staub
Beryllium oxide dust

The bags must be disposed of separately in accordance with national waste disposal laws.

Desoldered components containing BeO ceramics must also be disposed of in this way. All manufacturers of parts or components containing BeO ceramics that are known to Rohde & Schwarz gladly take back defective parts free of charge.

CHAPTER 2

DESIGN AND CHARACTERISTICS

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1 Device Purpose and Overview

The R&S SLx8000 low-power transmitters are used to transmit digital or analog TV signals. The signals are transmitted in the UHF or VHF frequency range in compliance with the modulation standards DVB(-T/H), ATSC, DTMB and MediaFLO (DTV) and B/G, M/N, I (ATV).

Note *The transmitter characteristics comply with the relevant standard specifications and EN standards thus meeting international requirements.*

The transmitter, which is integrated in a compact 19" housing, has been designed for low-maintenance and uncomplicated operation. All parts inside the instruments are maintenance-free. Automatic functions such as loading previously stored precorrection curves on changing channel make operation extremely easy. Precorrection by the user is unnecessary.

Fig. 1 *R&S SLV8010 – front view*

Fig. 2 *R&S SLV8050 – front view*

Fig. 3 *R&S SLV8010 – rear view*

Fig. 4 R&S SLV8050 – rear view

DTV and ADTV hardware models

The transmitters are available as DTV and ADTV models. Whereas the DTV model supports only digital television, the ADTV model also has connectors which allow analog TV signals to be transmitted. To be able to use ATV, however, the appropriate software option must also be installed.

Power classes

The R&S SLx8000 transmitter family comprises compact devices with the following power classes.

Transmitter	Amplifier option	TV standard	Nom. output power	Band	HU
R&S SLV8002	R&S SLX8000B42	DVB-T/H	2 W	UHF IV / V	2
		ATSC	3 W		
R&S SLV8005	R&S SLX8000B43	DVB-T/H	5 W		
		ATSC	8 W		
R&S SLV8010	R&S SLX8000B44	DVB-T/H	10 W		
		ATSC	16 W		

Transmitter	Amplifier option	TV standard	Nom. output power	Band	HU
R&S SLV8025	R&S SLX8000B45	DVB-T/H	25 W	UHF IV / V	3
		ATSC	40 W		
R&S SLV8025A	R&S SLX8000B45	Analog TV	50 W sync peak		
R&S SLV8050	R&S SLX8000B46	DVB-T/H	50 W		
		ATSC	80 W		
R&S SLV8050A	R&S SLX8000B46	Analog TV	125 W sync peak		
R&S SLV8100	R&S SLX8000B47	DVB-T/H	100 W		
		ATSC	160 W		
R&S SLV8100A	R&S SLX8000B47	Analog TV	250 W sync peak		
R&S SLW8025	R&S SLX8000B35	DVB-T/H	25 W	VHF III	
		ATSC	40 W		
R&S SLW8025A	R&S SLX8000B35	Analog TV	50 W sync peak		
R&S SLW8050	R&S SLX8000B36	DVB-T/H	50 W		
		ATSC	80 W		
R&S SLW8050A	R&S SLX8000B36	Analog TV	125 W sync peak		

User interface

The keypad and display are used for local operation of the transmitter. Important operating states are also signaled by LEDs in the front panel. The integrated Ethernet interfaces also allow the transmitter to be operated using a PC and web browser both locally and remotely by means of access over the Internet.

2 Modules and Components

The transmitter consists of the following modules and components:

- ADTV coder with
  - CPU
  - Display and keyboard interfaces
  - Device interfaces
  - Slot for CompactFlash memory card
- RF board with amplifier control unit
- Amplifier with 2 W, 10 W, 50 W or 100 W DVB power output (depending on the model)
- Front panel: White-on-blue display, 200 x 48 pixels
- Power supply unit
- Fan

Only the modules or components relevant to the user are described below.

2.1 Connectors

The connectors are all on the rear panel of the instrument (with the exception of the RF monitoring socket). The connectors listed here depend on the hardware model (DTV or ADTV) and hardware options that may be installed (e.g. GPS).

Connectors on rear panel (DTV and ADTV)

No.	Label	Type	Connection
X7	POWER OUT	N, female	RF output
X21	TS 1	BNC, female, 75 Ω	Transport stream input 1 (main signal; with hierarchy: HP stream)
X22	TS 2	BNC, female, 75 Ω	Transport stream signal 2 (standby signal; with hierarchy: LP stream)
X23	EXT 1 PPS	BNC, female, 50 Ω	Input for seconds pulse from external reference
X24	EXT REF	BNC, female, 50 Ω	Reference input, 5 MHz or 10 MHz, -5 dBm to 20 dBm or TTL
X29	REF OUT	BNC, female, 50 Ω	Monitoring output for internal 1 PPS or 10 MHz signal
X30	ETHERNET LOCAL	RJ-45, female	Connection of a PC for local operation; preset address at X30: – IP address: 192.168.57.253 – Subnet mask: 255.255.255.0

No.	Label	Type	Connection
X31	ETHERNET REMOTE	RJ-45, female	Network connection for remote access; preset address at X31: – IP address: 192.168.58.253 – Subnet mask: 255.255.255.0
X32	TX CONTROL	D-Sub, female (9-contact)	Interlock loop and CAN bus; connection for parallel remote-control interface or N+1 system
X8		Rubber-type connector	AC voltage feed

Connectors on rear panel (additional connectors for ADTV)

No.	Label	Type	Connection
X20	VF	BNC, female, 75 Ω	Analog video input
X25	BTSC	BNC, female, 75 Ω	Analog audio input to BTSC standard (M, N)
X26	NICAM DATA	BNC, female, 50 Ω	Digital data input for NICAM 728
X27	AUDIO 1	XLR, female, 600 Ω	Analog audio input AF1
X28	AUDIO 2	XLR, female, 600 Ω	Analog audio input AF2

Connectors on rear panel (depending on hardware option)

No.	Label	Type	Connection
X1	RECEIVER	N female, 50 Ω	Antenna input for DVB-T receiver option (retransmitter)
X2	GPS ANTENNA	N female, 50 Ω	Connection for optional GPS antenna
X3	RECEIVER AUX	N female, 50 Ω	Second antenna input for DVB-T receiver option (diversity reception)

Connector on front panel

No.	Label	Type	Connection
	RF MONITOR	SMA, female, 50 Ω	RF test output

2.2 Elements on Front Panel

2.2.1 Display

Local operation of the transmitter permits all the main information calls for the most important system parameters and their settings with intuitive graphical menus. Local operation of the transmitter is via menus on the display in combination with the control keys and cursor keys.

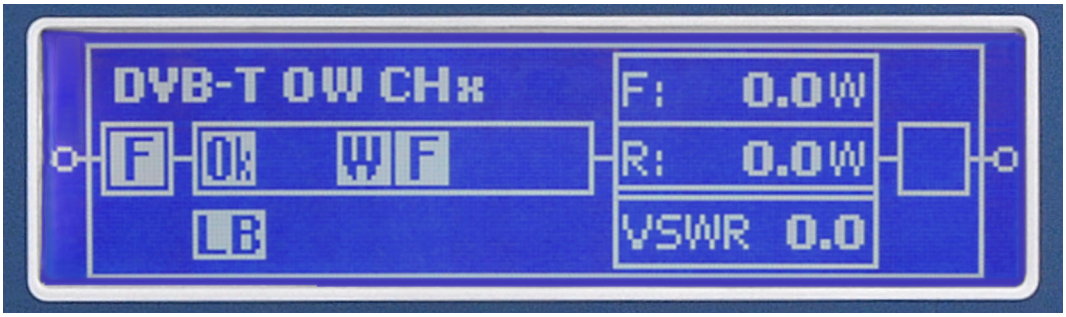

Fig. 5 *Display of the R&S SLx8000*

2.2.2 Keys and Indicators

A number of keys on the front panel are assigned two functions. The following applies:

– Press the key briefly = The function indicated on the key is executed
– Press the key longer = The function indicated above the key is executed

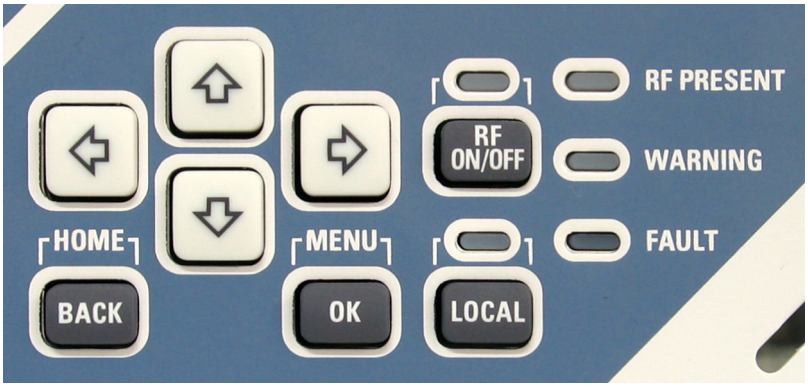

Fig. 6 *Keys and LEDs of the R&S SLx8000*

Menu keys

Key	Meaning / function
OK / MENU	**OK**: – Confirms an entry or selection **MENU**: – In system overview: starts the menu control function – From a menu: calls the context menu
BACK / HOME	**BACK**: – In a setting window: cancels the entered value, provided that it has not yet been confirmed with **OK** – In menu (general): move one step back in the history **HOME**: – Used to move from the menu tree back to the system overview
CURSOR KEYS	⇦⇨⇧⇩ : Navigation in the menu tree ⇦⇨ : Navigation to a digit in an entered value ⇧⇩ : Increments or decrements a number

Function keys and indicators

Key	Meaning / function
RF ON/OFF	Switches transmission mode ON or OFF. If transmission mode is functioning correctly, the transmitter delivers RF power.
LOCAL	Switches between local and remote operation With *local operation*, settings are made either at the front panel of the instrument or via a PC which is connected to **X30** (**ETHERNET LOCAL**). With *remote operation*, settings are made via a logged-on network client which is connected to the **X31** interface (**ETHERNET REMOTE**).

LED	Meaning
RF ON/OFF	LED (green) signals transmitter operation. If the transmitter is delivering power, the **RF PRESENT** LED also lights up.
LOCAL	LED (yellow) signals local operation. The instrument can no longer be operated remotely.
RF PRESENT	LED (green) signals that RF is present at the transmitter output. The LED goes out if the output power drops below a fixed threshold.
WARNING	LED (yellow) signals a transmitter sum warning.
FAULT	LED (red) signals a transmitter sum fault.

2.3 CompactFlash Card

The settings for the operating parameters of the transmitter are written on a CompactFlash memory card. The parameters can be transferred quickly from one device to another (e.g. a replacement device) by simply swapping the memory card.

2.4 Fan

The transmitter has a fan which draws in the cooling air through the intake vents in the front panel and outputs the heated air through exhaust vents in the rear panel.

The fan is attached to the outside of the rear panel and can therefore be replaced without opening the transmitter cover.

If the fan fails, a warning message is generated. If the temperature then increases too much, a fault message is output and the instrument is shut down in order to prevent the electronics from overheating.

2.5 Options

2.5.1 Power Supply Units

Different power supply units are used depending on the power class and intended use of the transmitter.

AC power supply units

Transmitter model	Power supply unit
Model 20	B9: 150 W
Model 30/31	B11: 1000 W

DC power supply units

Transmitter model	Power supply unit
Model 20	B10: 150 W
Model 30/31	B12: 1000 W

2.5.2 GPS Receiver

The optional integrated GPS receiver provides the transmitter with a frequency and time reference, e.g. for SFN operation.

2.5.3 DVB-T Receiver

By means of the optional DVB-T receiver, the transmitter can be configured as a retransmitter.

3 Specifications

3.1 General Data

TV standards

Models 20, 30 and 31 ..... DTV: DVB-T, ATSC

Model 31 ..... Analog TV: B/G, D/K, M, M1 (M + FM dual sound standard), N, I, I1

Frequency ranges ..... 165 MHz to 250 MHz (band III)
470 MHz to 860 MHz (band IV/V)

Step size for frequency adjustment ..... 1 Hz

Environmental conditions

Operating temperature range ..... +1 °C to +45 °C (device complies with specifications)

Permissible temperature range ..... 0 °C to +50 °C (data not guaranteed)

Max. permissible humidity ..... 95%, non-condensing

Power supply

Input voltage ..... 100 V to 240 V AC, ±10%
(100 V to 240 V, +10% for the R&S SLV8100A in analog TV operation)

Power frequency..... 47 Hz to 63 Hz, single-phase

Power consumption

DVB-T 10 W ..... ~ 130 W

Analog TV 250 W: ..... ~ 800 W

Mechanical resistance

Vibration, sinusoidal ..... 5 Hz to 150 Hz, max. 2 g at 55 Hz,
max. 0.5 g from 55 Hz to 150 Hz,
meets DIN EN 60068-2-6

Vibration, random ..... 10 Hz to 300 Hz,
acceleration 1.2 g (rms),
meets DIN EN 60068-2-64

Shock..... 20 g shock spectrum,
meets DIN EN 60068-2-27
and MIL-STD-810E

EMC ..... ETSI EN 301489-1 / -14
ETSI EN 302296 / 302297
Rec. 1999/519/EC

Immunity to radiated interference ..... Up to 10 V/m

Safety ..... EN 60950-1: 2001
CSA C22.2 No. 60950-1: 2003
UL 60950-1: 2003

Dimensions

Model 20 ..... 19", 2 HU

Models 30, 31 ..... 19", 3 HU

Weight

Models 20, 21 ..... 6 kg

Models 30, 31 ..... 12 kg

3.2 Specific Data: R&S SLx8000 DTV

3.2.1 Supported Modulation Parameters

Length of transport packet ..... 188 or 204 bytes

DVB

Coding and modulation ..... In line with EN 300744 with following parameters:

IFFT length ..... 2 k or 8 k (plus 4 k for DVB-H)

Modulation ..... QPSK, 16QAM or 64QAM

Guard interval ..... 1/4, 1/8, 1/16 or 1/32 of useful symbol period

Inner code rate ..... 1/2, 2/3, 3/4, 5/6 or 7/8

Hierarchy ..... α = 1, 2 or 4

Channel bandwidth ..... 6, 7, 8 MHz

SFN function ..... In line with TS 101 191

TPS and TX automatic ..... In line with TS 101 191 (MIP) with MFN and SFN

ATSC

Coding and modulation ..... In line with ATSC Doc. A/53

Bandwidth ..... 6 MHz

3.2.2 Input Processing

– All ASI modes (continuous, packet, burst) in line with DIN EN 500083-9
– Input FIFO: 8 k $\rightarrow$ ± 20 transport packets, burst

- Input switchover, manual and automatic
- Seamless input switchover
- Input monitoring
- MFN with stuffing and PCR correction
- FIFOs as buffers for dynamic delay changes
- MIP evaluation in compliance with TS 101 191 (DVB)

3.2.3 Precorrection

- Manual linear precorrection (up to 250 ns group delay, up to ±2dB frequency response)
- Manual nonlinear precorrection
- Nonlinear frequency response
- Limiter function
- Precorrection of amplifier asymmetry

3.2.4 Quality Data

SNR ..... > 37 dB, typ. 40 dB

MER ..... > 33 dB, typ. 40 dB

Shoulder attenuation ..... > 37 dB, typ. 40 dB

Frequency response <±0.5 dB

Group delay ..... < 10 ns

Carrier suppression ..... < -50 dBc referenced to transmitter RMS power

Sideband suppression ..... < -50 dBc referenced to transmitter RMS power

Phase noise

Frequency/carrier offset..... dBc/Hz:

10 Hz ..... < -65

100 Hz ..... < -90

1 kHz ..... < -95

10 kHz ..... < -100

100 kHz ..... < -112

1 MHz ..... < -130

Frequency stability ..... 10^{-7} / year

3.2.5 Harmonics and Nonharmonics

ATTENTION!
To comply with national standards on the antenna interface, the transmitter must only be operated with an output bandpass!

– **Harmonics:**

Transmitter	2nd harmonic	≥ 3rd harmonic
UHF, 100 W	Ch 21 to Ch 43: < -15 dBc Ch 44 to Ch 69: < -25 dBc	< -50 dBc
UHF, 50 W	Ch 21 to Ch 43: < -15 dBc Ch 44 to Ch 69: < -20 dBc	< -40 dBc
UHF, 10 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -50 dBc
UHF, 2 W	Ch 21 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -45 dBc	< -50 dBc
VHF, 50 W	Ch 05 to Ch 15: < -30 dBc	< -65 dBc

– **Out-of-band emissions:** < -37 dB (due to the shoulder distance)

– **Nonharmonics:** < -60 dB

3.3 Specific Data: R&S SLx8000 for Analog TV

3.3.1 Supported Video and Audio Standards

TV standards ..... B/G, M/N, D/K and I

Audio coding ..... Mono, IRT dual sound, BTSC, optional NICAM

3.3.2 Video Functions

– Input monitoring (sync-pulse width, period and amplitude)
– Black-level retention
– Evaluation of data line (audio mode)
– Amplitude control (using white pulse)
– Sync-pulse regeneration

– Receiver pre-equalization
– Vestigial sideband filtering

3.3.3 Audio Functions

Baseband audio

– Input level adaptation
– Matrixing
– FM modulation
– Precorrection of audio phase (only with FM carrier, depending on video signal)

With NICAM model

– Coding and modulation in line with EN 300 163
– Single sideband filtering

3.3.4 Precorrection

– Manual linear precorrection (up to 250 ns group delay, up to ±2 dB frequency response)
– Manual nonlinear precorrection
– Nonlinear frequency response
– Dynamic adjustment of nonlinear precorrection depending on video content
– Precorrection of amplifier asymmetry

3.3.5 Quality Data

3.3.5.1 With Standard Factory Precorrection

3.3.5.2 With Manual Postcorrection

Video

S/N ratio ..... ≥ 63 dB (> 200 kHz, < 5 MHz, CCIR-weighted)
Differential phase ..... ≤ ±3°
Differential amplitude ..... ≤ ±5%
VF frequency response ..... ≤ ±0.5 dB
VF group delay ..... ≤ ±25 ns

Audio

FM signal-to-noise ratio ..... ≤ -60 dB (CCIR weighted)

AF frequency response ..... < 0.2 dB (preemphasis and deemphasis OFF)

AF total harmonic distortion ..... < 0.5% (at ±30 kHz deviation)

3.3.5.3 Miscellaneous

Carrier suppression (with respect to vision carrier) ≤ -50 dBc

Phase noise

Frequency/carrier offset ..... dBc/Hz:

10 Hz ..... < -65

100 Hz ..... < -90

1 kHz ..... < -95

10 kHz ..... < -100

100 kHz ..... < -112

1 MHz ..... < -130

Frequency stability ..... 10^{-7} / year

3.3.6 Harmonics and Nonharmonics

ATTENTION!
To comply with national standards on the antenna interface, the transmitter must only be operated with an output bandpass!

– **Harmonics:**

Transmitter	2nd harmonic	≥ 3rd harmonic
UHF, 100 W	Ch 21 to Ch 43: < -15 dBc Ch 44 to Ch 69: < -25 dBc	< -50 dBc
UHF, 50 W	Ch 21 to Ch 43: < -15 dBc Ch 44 to Ch 69: < -20 dBc	< -40 dBc
UHF, 10 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -50 dBc
UHF, 2 W	Ch 21 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -45 dBc	< -50 dBc
VHF, 50 W	Ch 05 to Ch 15: < -30 dBc	< -65 dBc

– **Out-of-band emissions:** < -30 dB

– **Nonharmonics:** < -60 dB

CHAPTER 3

INSTALLATION

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1 Unpacking and Setting Up

1.1 Equipment Supplied

The following items are supplied as standard:

- R&S SLx8000 compact transmitter in one of the following versions:
  - R&S SLV8002 (model 20): 2 W, 2 HU, band IV/V
  - R&S SLV8010 (model 20): 10 W or 5 W, 2 HU, band IV/V
  - R&S SLV8050 (model 30/31): 50 W or 25 W, 3 HU, band IV/V
  - R&S SLM8050 (model 30/31): 50 W, 3 HU, band III
  - R&S SLV8100 (model 30/31): 100 W, 3 HU, band IV/V
- Power cable
- Short-circuit connector for **X32**
- This user manual on CD

1.2 Unpacking Instrument

☞ Carefully remove the transmitter from its shipping box and, using the shipping documents, check that all items are present.

1.3 Setting Up Instrument

The transmitter can be stood on its feet and operated as a standalone device, or can be installed in a 19" rack. Depending on which model is selected, 2 or 3 height units are required for installation in a 19" rack.

Note *Make sure that the instrument is in a stable position and sufficiently ventilated. It is particularly important to ensure that the flow of air through the intake vents in the front panel and through the exhaust vents in the rear panel (fan) is not obstructed.*

2 Connecting Cables

WARNING!
Always make sure that the power supply is disconnected before connecting any devices. This will prevent injuries and damage to the devices.

2.1 Overview of Connectors

Fig. 1 *Connectors on rear panel of R&S SLV8010*

Fig. 2 Connectors on rear panel of R&S SLV8050

Connectors on rear panel (DTV and ADTV)

No.	Label	Type	Connection
X7	POWER OUT	N, female	RF output
X21	TS 1	BNC, female, 75 Ω	Transport stream input 1 (main signal; with hierarchy: HP stream)
X22	TS 2	BNC, female, 75 Ω	Transport stream signal 2 (standby signal; with hierarchy: LP stream)
X23	EXT 1 PPS	BNC, female, 50 Ω	Input for seconds pulse from external reference
X24	EXT REF	BNC, female, 50 Ω	Reference input, 5 MHz or 10 MHz, -5 dBm to 20 dBm or TTL
X29	REF OUT	BNC, female, 50 Ω	Monitoring output for internal 1 PPS or 10 MHz signal
X30	ETHERNET LOCAL	RJ-45, female	Connection of a PC for local operation; preset address at X30: – IP address: 192.168.57.253 – Subnet mask: 255.255.255.0
X31	ETHERNET REMOTE	RJ-45, female	Network connection for remote access; preset address at X31: – IP address: 192.168.58.253 – Subnet mask: 255.255.255.0
X32	TX CONTROL	D-Sub, female (9-contact)	Interlock loop and CAN bus; connection for parallel remote-control interface or N+1 system
X8		Rubber-type connector	AC voltage feed

Connectors on rear panel (additional connectors for ADTV)

No.	Label	Type	Connection
X20	VF	BNC, female, 75 Ω	Analog video input
X25	BTSC	BNC, female, 75 Ω	Analog audio input to BTSC standard (M, N)
X26	NICAM DATA	BNC, female, 50 Ω	Digital data input for NICAM 728
X27	AUDIO 1	XLR, female, 600 Ω	Analog audio input AF1
X28	AUDIO 2	XLR, female, 600 Ω	Analog audio input AF2

Connectors on rear panel (depending on hardware option)

No.	Label	Type	Connection
X1	RECEIVER	N female, 50 Ω	Antenna input for DVB-T receiver option (retransmitter)
X2	GPS ANTENNA	N female, 50 Ω	Connection for optional GPS antenna
X3	RECEIVER AUX	N female, 50 Ω	Second antenna input for DVB-T receiver option (diversity reception)

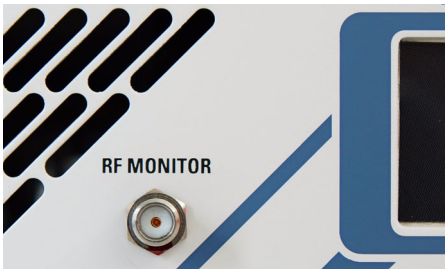

Fig. 3 *RF test output on front panel of R&S SLx8000*

Connector on front panel

No.	Label	Type	Connection
	RF MONITOR	SMA, female, 50 Ω	RF test output

2.2 Connecting Input Signals

Inputs for digital TV

The input signals can be fed in ASI or SMPTE format.

1. Connect the first transport stream to **X21** (**TS 1**). With hierarchical coding (DVB only), **X21** is the input for the HP stream.
2. If signal standby is required, connect a second transport stream to **X22** (**TS 2**). With hierarchical coding, **X22** is the input for the LP stream.

Inputs for analog TV

1. Connect the video signal to **X20** (**VF**).
2. Feed audio signals according to signal type:
   a) AF signals: Connect AF1 to **X27** (**AUDIO 1**) and AF2 to **X28** (**AUDIO 2**).
   b) NICAM: If an external NICAM coder is used, additionally connect the NICAM 728 data stream to **X26** (**NICAM DATA**).

   Separate feed of the NICAM 728 data stream is unnecessary if the NICAM coder integrated in the transmitter is used.
   c) BTSC: As an alternative to a) and b), connect a multiplex signal to **X25** (**BTSC**).

2.3 Connecting External Reference Sources

1. To increase frequency accuracy, connect an external reference source (5 MHz or 10 MHz) to **X24** (**EXT REF**).

Note *Alternatively, the seconds pulse of an external 1 pps signal (at **X23**) or of the optional internal GPS receiver (GPS antenna at **X2**) can be used as the frequency reference.*

2. For SFN operation, additionally feed a 1 pps signal to allow time synchronization:
   a) If the optional internal GPS receiver is used, connect the GPS antenna to **X2** (**GPS ANTENNA**).
   b) Alternatively, feed the 1 pps signal of an external reference source via **X23** (**EXT 1 PPS**).

2.4 Connecting Antenna Network

WARNING!
Risk of RF burns. Before connecting the antenna cable, make sure that the transmitter cannot output RF.

☞ Connect the antenna system to **X7** (**POWER OUT**).

2.5 Preparing Interlock Loop

WARNING!
Risk of RF burns. Before putting the transmitter into operation, make sure that available interlock loop systems are used.

☞ Prepare the interlock loop system (if available) for connection to **X32** (**TX CONTROL**).

☞ If no interlock loop devices are available in the transmitter system (only permissible with low power), have the supplied short-circuit connector at the ready.

Note *The interlock loop is only closed via **X32** (**TX CONTROL**) after (!) the transmitter has been put into operation (see the next chapter) so that the transmitter can later deliver RF.*

2.6 Connecting User Interface

To make local operation of the transmitter easier, a PC/laptop can be connected. Furthermore, it is also possible to connect the transmitter to a remote monitoring network. An Ethernet link is used for connection.

Rohde & Schwarz recommends the use of an RJ-45 cable which complies with the CAT 5e specification.

Connecting a PC for local operation

☞ Connect the PC to the **X30** interface (**ETHERNET LOCAL**).

Connecting to a remote monitoring network

☞ Connect the IP network to the **X31** interface (**ETHERNET REMOTE**).

2.7 Connecting AC Power Supply

The transmitter is available with various power supply units:

– B9/B11 (AC/DC): Voltage range 100 V AC to 230 V AC, 50 Hz to 60 Hz
– B10/B12 (-48 V DC): Voltage range -36 V DC to -72 V DC

ATTENTION!
The device can be damaged by overvoltage. Make sure that the AC supply voltage provided by your local power supply network complies with the specifications of the power supply unit installed in your transmitter.

Check the power cable for damage.

1. Set the power switch on the rear of the instrument to 0 (OFF).
2. Connect the instrument to the power supply using the supplied power cable.

CHAPTER 4

COMMISSIONING

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1 General Information

This chapter describes the settings needed to generate the required RF signal with the correct frequency and correct level at the output of the exciter.

Transmitters are put into operation using the transmitter graphical user interface.

1.1 Preparations

Before you can put a transmitter into operation, it must first have been fully installed. Therefore, before switching on the instrument, check the following list to ensure that all connections have been made correctly:

1. Check whether the transmitter has been connected correctly (signal feed, reference sources, remote-control interfaces; see the chapter "Installation").
2. Check whether the transmitter has been connected correctly to the AC supply (see the chapter "Installation").
3. Also check the following points:
   a) At RF output

      Output network (antenna/dummy antenna, matrix, directional-coupler filter, channel filter) connected correctly? Terminating resistor 50 Ω and power-handling capacity P > nominal transmitter power?

   b) Interlock loop

      In order to prevent inadvertent transmission while putting the transmitter into operation, make sure that the interlock loop at **X32** is *not yet (!)* closed.
4. Check that all cable connections are fitted securely.

1.2 Preparing for Local Operation

Local operation of the transmitter is possible in two ways:

– using the display and the menu keys on the front panel of the instrument
– using a web browser and PC which is connected to **X30** (remote operation)

Note *In the following descriptions, it is assumed that the transmitter is operated locally from the front panel. Detailed information on remote operation can be found in the chapter "Operating".*

ATTENTION!
The transmitter starts up with the most recently set parameters. In order to prevent damage resulting from an incorrect frequency setting, transmission must be avoided while the transmitter is being put into operation:

Therefore do not close the interlock loop (see the section "Preparations").

1. Switch on the transmitter using the toggle switch (position I) on the rear of the instrument.

   The transmitter boots up. After a few seconds, the system overview appears on the display.

Fig. 1 *System overview on R&S SLx8000 display*

2. Press the **Local** key so that the associated LED lights up.

   The transmitter is now in Local mode and can be operated locally. You are automatically logged on with the user ID "Operation".

Since operation rights do not permit you to set basic transmitter parameters, you must change the user ID.

1.3 Changing User ID

You must have configuration rights to configure the transmitter fully.

1. Press the **MENU** key (press and hold down) to call the context menu.
2. From the context menu, select the menu item **Change User**.

   The **Logon** window opens. The current user ID is displayed to the right of **Select user from list**.

Fig. 2 *Changing user at display in local operation mode*

3. Under **Select user from list**, select the user ID **Configuration**.

   After confirming with **OK**, you are logged on again with configuration rights.

Note *No password needs to be entered if the transmitter is operated locally using the display and menu keys.*

1.4 Operating Transmitter

Note *Detailed information on operating the transmitter can be found in the chapter "Operating".*

2 Configuring Transmitter

The following steps are the minimum requirement for correct transmitter operation:

- Setting the date/time (basic settings)
- Selecting the TV standard and parameterizing the coding
- Configuring the input interfaces
- Selecting and adjusting the reference sources
- Setting the transmission frequency
- Setting the output power
- Activating RF

Whereas the coding settings and input interface settings vary depending on the used TV standard, the other steps are the same irrespective of the TV standard.

2.1 Entering Basic Settings

2.1.1 Setting Date and Time

1. Select **System Setup** > **Date | Time**.

   The **Date | Time** window opens.

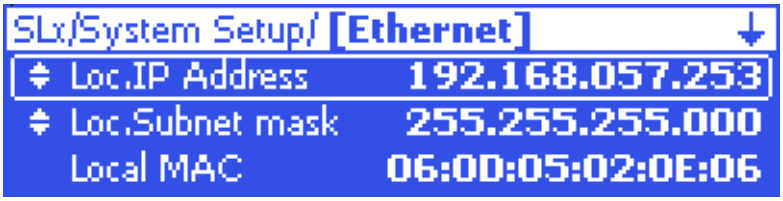
2. Set the date and local time.

2.1.2 Configuring Remote Connection

If a remote Ethernet connection is to be used, you must configure the interface **X31** (**ETHERNET REMOTE**) in such a way that it is in the subnet of your remote monitoring system.

1. Select **System Setup** > **Ethernet**.

   The **Ethernet** window opens.



2. Under Rem.IP Address and Rem.Subnet mask, set the appropriate IP address and subnet mask.

2.2 Making Specific Settings for a TV Standard

2.2.1 Selecting TV Standard: DVB, ATSC or Analog TV

1. Select **System Setup** > **Transmitter**.

   The **Transmitter** window opens.

2. Under **Tx Type**, select the required TV standard **DVB**, **ATSC** or **ATV** (Analog TV).

   The transmitter reboots automatically if the TV standard is changed.

2.2.2 DVB(-T/H): Basic Settings, Coding, Signal Feed

2.2.2.1 Making Basic Settings

1. Select **TV Settings** > **DVB** > **Common**.

   The **Common** window opens.

2. Under **Digital Standard**, select the **DVB-T** or **DVB-H** mode.
3. Under **Network Mode**, select the required network mode **MFN** or **SFN**.

4. Under **TPS Source**, you determine whether the DVB parameters are to be read out from the MIP or set manually.
5. Make the other settings listed in the table below:

Setting item	Explanation
Digital Standard	Used to select the digital TV standard: DVB-T or DVB-H
Network Mode	Used to select the network operating mode: SFN or MFN
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets *The TPS source can also be set in the TV Settings > DVB > TPS menu window.*
Cell ID Enable	Used to switch cell ID signaling on or off in the TPS The cell ID itself is set in the TV Settings > DVB > TPS menu window. It can also be retrieved from the MIP. The Cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set.
Tx Address	Used to set the transmitter address; address range: 0 to 65535 Setting the transmitter address is a precondition to reading Tx information (transmitter-specific settings) from the MIP. However, the information is only used if Tx Automatic is enabled.
Tx Automatic	Used to switch Tx Automatic on or off If Tx Automatic is activated (and the transmitter address is set), the following Tx parameters are retrieved from the MIP: Time Offset, Frequency Offset and Cell ID

Display	Explanation
Amplifier Control	Indicates the status of amplifier control

2.2.2.2 Setting TPS Parameters Manually

Note *You can only configure the TPS parameters manually if the **Manual Presets** setting is selected for **TPS Source**.*

1. Select **TV Settings** > **DVB** > **TPS**.

   The **TPS** window opens.

2. Set the following TPS parameters: Bandwidth, FFT Length, Guard Interval and Constellation (modulation mode).
3. Make the other settings listed in the table below:

Setting item	**Explanation**
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets

Display/ setting item	**Explanation of active or manually set TPS parameters**
Bandwidth	Signal bandwidth Display/setting: 5, 6, 7 or 8 MHz
FFT Length	IFFT length Display/setting: 2k or 8k; also 4k for DVB-H
Guard Interval	Guard interval Display/setting: 1/4, 1/8, 1/16 or 1/32
Constellation	Modulation mode Display/setting: QPSK, 16QAM or 64QAM *With hierarchical coding*, the value refers to the sum of constellation points from HP and LP Stream; possible values are therefore: 16QAM or 64QAM
Alpha	*Hierarchical parameter*α Display/setting: – No Hier: no hierarchical coding – 1 H: hierarchical coding with α = 1 – 2 H: hierarchical coding with α = 2 – 3 H: hierarchical coding with α = 3 1 H, 2 H or 3 H activates the hierarchical coding mode. However, this is only possible if Constellation is set to 16QAM or 64QAM.

Display/ setting item	Explanation of active or manually set TPS parameters
Cell ID	Cell ID Display/setting: 0x0000 to 0xFFFF The cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set in the TV Settings > DVB > Common menu. For the purpose of signaling in the output signal (TPS), the Cell ID Enable parameter must also be activated in the TV Settings > DVB > Common menu.
Interleaver	Interleaver Display/setting: – nat: Default setting ("native") with standard function for DVB-T – in depth: 8k interleaving for DVB-H with IFFT lengths of 2k and 4k to improve transmission reliability (*DVB-H parameter*)
Code Rate [HP/LP]	Internal code rate (separate for HP and LP stream) Display/setting: 1/2, 2/3, 3/4, 5/6 or 6/7
Time Slicing [HP/LP]	Time slicing flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: A flag is set in the broadcast DVB signal. This flag informs the receiver that at least one service in the DVB-H data stream uses time slicing.
MPE FEC [HP/LP]	MPE FEC flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: This flag informs the receiver that at least one service in the DVB-H data stream uses the forward error correction for MPE (Multi Protocol Encapsulation).
Req. Data Rate [HP/LP]	Displays the data rate required at the input for the currently active TPS settings (see the TV Settings > Input > TS1(HP) menu and the TV Settings > Input > TS2(LP) menu)

2.2.2.3 Checking Delays under SFN Delay - SFN Mode Only

1. Select **TV Settings** > **DVB** > **SFN Delay**.

   The **SFN Delay** window opens.

2. If necessary, enter a **Static Delay** and check whether the **Dynamic Delay** is between **0** and **1** second (if this is not the case, the single-frequency condition is violated).

Detailed information is given in the table below:

Display	Explanation
Maximum Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the transmitter antenna for regular transmission. This delay is set in the MIP inserter and is the default for all transmitters of the SFN.
Network Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the input of the exciter. This delay depends on the used transmission path.
Processing Delay	Minimum turnaround time of the signal by the exciter. This delay depends on the DVB transmission parameters.
Dynamic Delay	Time by which signal processing is delayed artificially in order to achieve the required time of transmission.
Total Delay	Actual turnaround time of the signal by the exciter. This time is the sum of Processing Delay plus Dynamic Delay.
Tx Offset Delay	Positive or negative offset (transferred in the MIP for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. This delay is only displayed and activated if Tx Automatic has been activated and the Tx address of the transmitter is correct. *If Tx Offset Delay and Static Delay are present at the same time, their effects are added together.*

Setting item	Explanation
Static Delay	Positive or negative offset (set manually for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. The Static Delay is used to compensate differences between transmission systems from different manufacturers. *If Static Delay and Tx Offset Delay are present at the same time, their effect is added together.*
Max Deviation Time	Maximum deviation in the calculated time of transmission which can be corrected without interrupting transmission. Default setting: 10 µs

2.2.2.4 Configuring Input Interfaces and Automatic Input Selection

Setting data format for transport stream TS1

1. Select **TV Settings** > **Input** > **TS1(HP)**.

   The **TS1(HP)** window opens.

2. Under **Presel. Mode**, select the data format for transport stream TS 1. If **AUTO** is selected, the data format is detected automatically.

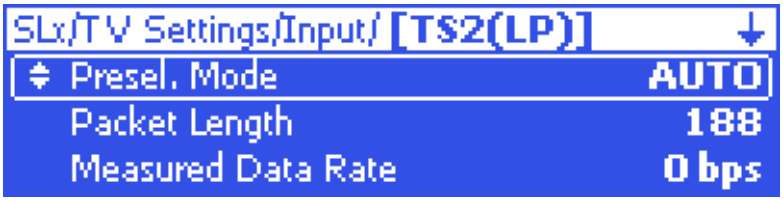
Note *In DVB-H mode, the HP stream is fed via the input TS 1.*

Setting data format for transport stream TS 2

If a second transport stream TS 2 is used for standby purposes or for the LP stream in the case of hierarchy:

1. Select **TV Settings** > **Input** > **TS2(LP)**.

   The TS2(LP) window opens.



2. Under **Presel. Mode**, select the data format for transport stream TS 2. If **AUTO** is selected, the data format is detected automatically.

Setting automatic input switchover (not with hierarchy)

If two transport streams TS 1 and TS 2 are used for standby purposes, you can activate and configure the automatic input switchover function:

1. Select **TV Settings** > **Input** > **Input Automatic**.

   The **Input Automatic** window opens.

2. Under **Autoswitch**, activate the automatic input switchover function and make the other settings listed in the table below.

Setting item	Explanation
Preselect Input	Used to preselect the active input – INPUT 1: Operating input is **TS 1**. – INPUT 2: Operating input is **TS 2**.
Autoswitch	Used to switch *automatic input switchover* on or off In the event of a failure at the (active) operating input, automatic switchover to the standby input takes place. The automatic switchover mode is defined by the following parameter settings.
Seamless Switching	Used to switch seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. *The function has no effect when automatic input switchover is deactivated.*
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Normally, it is not possible to switch back to a failed operating input following a switchover. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place, the system switches back to the preselected operating input as soon as the signal reappears.
Check Time Forward	Used to set a delay time (0 to 60 s) which must elapse before the standby input becomes active following failure of the operating input.
Check Time Back	Used to set a delay time (0 to 60 s) which must elapse before the (now active) standby input is switched back over to the preselected operating input. *The function has no effect if the priority mode is set to EQUAL.*
On Loss Of Input	Used to set the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed – Mute: Suppression of the output signal when the data rate is incorrect
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed.
Fail Delay Time	Used to set a delay time which must elapse following an input signal failure before a sum fault is generated.

2.2.3 ATSC: Signal Feed

2.2.3.1 Configuring Input Interfaces and Automatic Input Selection

Setting data format for transport streams TS 1 and TS 2

1. Select **TV Settings** > **ATSC** > **Input Config**.

   The **Input Config** window opens.

2. Under **Presel. Mode HP1**, select the data format for transport stream TS 1. If **AUTO** is selected, the data format is detected automatically.
3. Under **Presel. Mode HP2**, select the data format for transport stream TS 2 if a second signal feed (signal standby) is used. If **AUTO** is selected, the data format is detected automatically.

Setting automatic input switchover

If two transport streams TS 1 and TS 2 are used for standby purposes, you can activate and configure the automatic input switchover function:

1. Select **TV Settings** > **ATSC** > **Input Automatic**.

   The **Input Automatic** window opens.

2. Under **Autoswitch**, activate the automatic input switchover function and make the other settings listed in the table below.

Setting item	Explanation
Preselect Input	Used to preselect the active input – INPUT 1: Operating input is **TS 1**. – INPUT 2: Operating input is **TS 2**.

Setting item	Explanation
Autoswitch	Used to switch *automatic input switchover* on or off In the event of a failure at the (active) operating input, automatic switchover to the standby input takes place. The automatic switchover mode is defined by the following parameter settings.
Seamless Switching	Used to switch seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. *The function has no effect when automatic input switchover is deactivated.*
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Normally, it is not possible to switch back to a failed operating input following a switchover. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place, the system switches back to the preselected operating input as soon as the signal reappears.
Check Time Forward	Used to set a delay time (0 to 60 s) which must elapse before the standby input becomes active following failure of the operating input.
Check Time Back	Used to set a delay time (0 to 60 s) which must elapse before the (now active) standby input is switched back over to the preselected operating input. *The function has no effect if the priority mode is set to EQUAL.*
On Loss Of Input	Used to set the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed – Mute: Suppression of the output signal when the data rate is incorrect
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed.
Fail Delay Time	Used to set a delay time which must elapse following an input signal failure before a sum fault is generated.

2.2.4 Analog TV: Basic Settings, Video and Audio

2.2.4.1 Making Basic Settings

1. Select **TV Settings** > **ATV** > **Common**.

   The **Common** window opens.

Detailed information is given in the table below:

Setting item	Explanation
TV Standard	Used to select the ATV standard
IRT-NICAM	Setting: IRT or NICAM (for standards B|G, D|K, I, I1) – IRT: Second sound subcarrier is frequency-modulated – NICAM: Second sound subcarrier is modulated according to the NICAM specification
NICAM Mode	Used to select the NICAM mode (for standards B|G, D|K, I, I1): – Coder: AF signal feed of AF1 and AF2 via the inputs AUDIO 1 and AUDIO 2 as well as coding and modulation in the transmitter – Modulator: Signal feed as NICAM 728 data stream via the digital input NICAM DATA
NICAM Rolloff	Used to set the NICAM rolloff (for standards B|G, D|K, I, I1): – Auto: NICAM rolloff is automatically set according to the selected TV standard and in compliance with the NICAM specifications (*recommended setting !*) – 40% / 100%: Manual setting of the NICAM rolloff
Sound Select	Used to select the number of sound subcarriers (for standards B|G, D|K, I, I1, M1): – Single Carrier: One sound subcarrier – Dual Carrier: Two sound subcarriers
FM Input	Setting: AF 1 or BTSC (for standards M, N) – AF 1: MONO audio mode, signal feed via input AUDIO 1 – BTSC: BTSC audio mode, signal feed via input BTSC

2.2.4.2 Performing Video Control

1. Select **TV Settings** > **ATV** > **Vision** > **White Control**.

   The **White Control** window opens.

2. Make the required settings:

Setting item	Description
Automatic	Switches *white control* on or off.
Testline	Selects the test line for the white pulse. The test line can be in the first or second field.
Gain Source	Selection of the source for fixed video gain in case of*failure of the white pulse* with white control simultaneously switched on. The options are as follows: – MANUAL: For the gain, the manual settings under Manual Gain apply. – MEMORY: The gain uses the most recently saved value for white control.
Manual Gain	Manual setting of the video gain The value which is set is the gain of the actuator as a percentage referred to gain 1.

Display	Description
Memory Gain	Display of the last value saved by the *white control* which can be used for fixed video gain. The value which is displayed is the gain of the actuator as a percentage referred to gain 1.
Current Gain Source	Display of the active source for the video gain: – Manual: Manual setting (see Gain Source) – Memory: Memory for the white control (see Gain Source) – Automatic: White control
White Amplitude Input	Measured value for the white amplitude input
White Amplitude Output	Measured value for the white amplitude output
White Pulse Monitoring	Status display for the white pulse monitoring: – NONE: The test line with the white pulse was not found – OK: White pulse found and level OK – < -40% / < -30% / > +30% / > +40%: The level of the white pulse deviates from the nominal value by the displayed value.

2.2.4.3 Setting White Limiter

1. Select **TV Settings** > **ATV** > **Vision** > **White Limiter**.

   The **White Limiter** window opens.

2. Make the required settings:

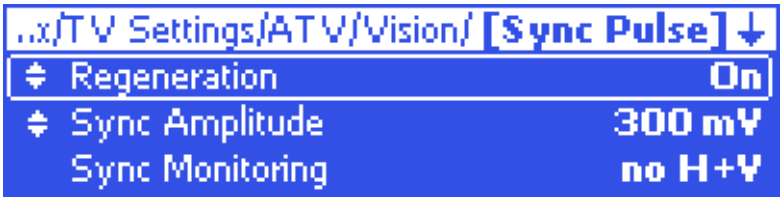
Setting item	Description
Limiter	Switches the *white limiter* on or off.
Threshold	Sets the threshold for the *white limiter*.

Display	Description
Limiter Active	Status display for indicating if the white limiter responds.

2.2.4.4 Setting Sync-Pulse Regeneration

1. Select **TV Settings** > **ATV** > **Vision** > **Sync Pulse**.

   The **Sync Pulse** window opens.



2. Make the required settings:

Setting item	Explanation
Regeneration	Used to switch *sync-pulse regeneration* on or off
Sync Amplitude	Used to set the amplitude of the regenerated sync pulse (with regeneration switched on)

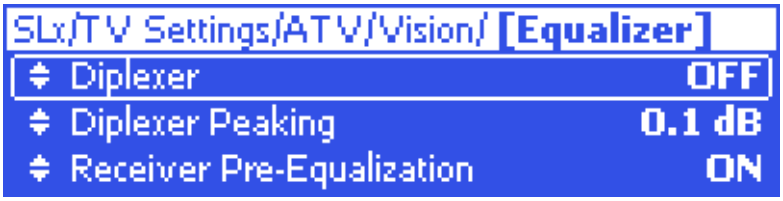
Display	Explanation
Sync Monitoring	Indicates the status of sync-pulse monitoring of the input signal. The following may be displayed: – OK: A standard input signal is being applied – no V: No V-pulse frame detected – no H+V: No V and H-pulse frame detected – too low: Sync-pulse amplitude is less than 50% of the nominal sync-pulse amplitude; the processed signal is, however, available at the encoder output
Sync Amplitude Input	Displays the measured input amplitude [mV] of the sync pulse. If the selected scanning line is not found in the input signal, the measurement value 0 mV is displayed.
Sync Amplitude Output	Displays the measured output amplitude in [mV] of the sync pulse

2.2.4.5 Performing Receiver Pre-Equalization and Diplexer Peaking

Note *Use of the diplexer peaking function is recommended only after level control has been completed.*

1. Select **TV Settings** > **ATV** > **Vision** > **Equalizer**.

   The **Equalizer** window opens.



2. Make the required settings:

Setting item	Explanation
Diplexer	Used to switch the *diplexer pre-equalization* (diplexer peaking) on or off
Diplexer Peaking	Used to set the peaking in the range 0.1 dB to 2.5 dB at the band limit of the upper sideband
Receiver Pre-Equalization	Used to switch the *receiver pre-equalization* on or off

2.2.4.6 Adjusting AF Nominal Level and Level Adaptation to NICAM Coder

The functions available for sound adjustment depend on the selected audio standard.

1. Select **TV Settings** > **Input** > **Sound** >
   a) **Input B|G, D|K, I, M1** for IRT dual sound
   b) **Input M, N** for FM mono sound
   c) **Input M, N BTSC** for BTSC dual sound
   d) **Input NICAM Mod** for FM mono sound with NICAM, Modulator mode (NICAM 728 data stream fed from an external source)
   e) **Input NICAM Cod** for FM mono sound with NICAM, Coder mode (NICAM 728 data stream generated in the transmitter itself)

   The associated input window opens.

2. Make the required settings:

Note *The table shows all settings and displays, some of which are not available with all audio standards.*

Setting item	Explanation
Nominal Level [AF1 / AF2 / BTSC]	Used to set the nominal input level for the AF signal AF1 and AF2 or a BTSC signal
Gain Adjustment NICAM [AF1 / AF2]	Used to adapt the nominal input level for the AF signal AF1 or AF2 which is fed to the integrated NICAM coder
Preemphasis [FM]	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Preemphasis [NICAM]	Used to switch the pre-emphasis required by the TV standard on or off for NICAM sound
Lowpass [FM]	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2 / BTSC]	Indicates the current input level at the FM sound modulator for the signal AF1, AF2 or BTSC as a percentage of the maximum drive level
Current Input Level NICAM [AF1 / AF2]	Indicates the current input level at the NICAM coder for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping FM [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible input level, the amplitude is limited. This is signaled by the Input Clipping status display.

Display	Explanation
Input Clipping BTSC	If the BTSC signal exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.
Input Clipping NICAM [AF1 / AF2]	If the AF signal AF1 or AF2 is amplified beyond the permissible input level at the NICAM coder, the amplitude is limited. This is signaled by the Input Clipping NICAM status display.

2.2.4.7 Setting Audio Mode of Coder and Switching On Pilot Tone

1. Select **TV Settings** > **ATV** > **Sound** > **FM Audio Mode**.

   The **FM Audio Mode** window opens.

2. Make the required settings:

Setting item	Description
Coder Mode	Setting of the *audio mode*. The following settings are possible: Off, Mono, Stereo, Dual and Auto (Dataline). The selected TV standard determines the assignment of the audio inputs to the FM sound subcarriers. The following settings have a special meaning: – Off: Dual sound is set as the audio mode – Auto (Dataline): The audio mode is read from the*audio data line* in the picture signal.
Dataline	Selects the *audio data line* present in the picture signal; this is necessary for the Coder Mode > Auto setting.
Pilot	Switches the *pilot signal* on or off; not active in conjunction with NICAM.
Pilot Gain	Sets the level for the *pilot signal*; not active in conjunction with NICAM.

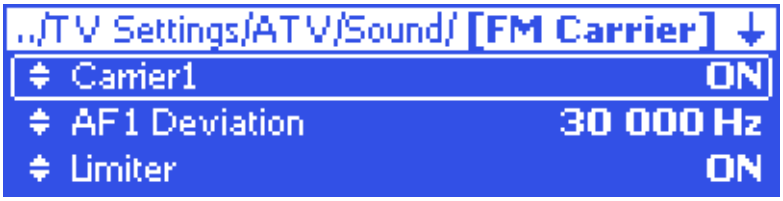
Display	Description
Dataline Info	Display of the indication of the *audio mode* present in the audio data line (N/A means there is no indication in the selected audio data line).
Current Audio Mode	Display of the *audio mode* that is currently set.

Display	Description
Current Pilot Deviation	Display of the FM deviation for the *pilot signal*.

2.2.4.8 Setting Sound Carrier/Nominal Deviation and Deviation Limiter

1. Select **TV Settings** > **ATV** > **Sound** > **FM Carrier**.

   The **FM Carrier** window opens.



2. Make the required settings:

Setting item	Explanation
Carrier 1/Carrier 2	Used to set the mode for FM sound subcarrier 1 or 2; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
Nom. Deviation [Carrier 1/Carrier 2]	Used to set the nominal *FM deviation* for sound subcarrier 1 and 2
Deviation Limiter	Used to switch the deviation limiter for the FM sound subcarrier on or off
Limiter Threshold	Used to set a threshold at which the deviation limiter is triggered
Warning Above	Used to set a threshold at which the deviation limiter warning is activated *In most cases, it is recommendable for Limiter Threshold and Warning Above to have the same value.*

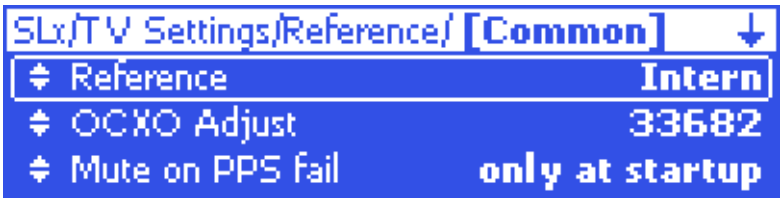
Display	Explanation
Current Deviation [Carrier 1/Carrier 2]	Indicates the current FM deviation for sound subcarrier 1 and 2
Limitation [Carrier 1/Carrier 2]	Status display which indicates whether the deviation limiter has triggered

2.3 Selecting and Adjusting Reference Sources

2.3.1 Selecting Reference Frequency Source and Determining Response on Failure

1. Select **TV Settings** > **Reference** > **Common**.

   The **Common** window opens.



2. Under Reference, select a reference frequency source and determine how the transmitter is to respond if a reference source fails.

Detailed information is given in the table below:

Setting item	Explanation
Reference	Used to select the reference frequency source. The following settings are possible: – Internal: Operation without external reference frequency source – External 5 MHz: Operation with external 5 MHz reference applied – External 10 MHz: Operation with external 10 MHz reference applied – External 1pps: Operation with external time reference (1 pps) – Internal GPS: Operation with optional internal GPS receiver
OCXO Adjust	Used to adjust an internal OCXO frequency (for operating mode "Internal")
Mute on PPS Fail	Used to determine the behavior in SFN mode in the event of failure of the external time reference. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid 1 pps signal is detected; if the 1 pps signal fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the 1 pps signal fails for longer than the period specified under Fail Delay Time This is the recommended setting for operation in SFN mode.

Setting item	Explanation
Mute on Ref. Fail	Used to determine the behavior in SFN and MFN mode in the event of failure of the external reference frequency source. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid reference source is detected; if the reference source fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the reference source fails for longer than the period specified under Fail Delay Time This is the recommended setting for operation in SFN mode.
Fail Delay Time	If a reference source fails, the time specified here must elapse before the output signal is suppressed. The setting is effective if "after fail delay time" is set under Mute on PPS Fail or Mute on Ref. Fail. Selection: 0 to 24 hours; 0 hours = no delay time

2.3.2 Setting Antenna Type for Internal GPS Receiver

Note *The following setting is only necessary if you use the optional internal GPS module.*

1. Select **TV Settings** > **Reference** > **GPS** > **Status**.
   The **GPS** > **Status** window opens.

2. Under Antenna type, select the connected antenna type:
   a) active: The active antenna is supplied with 5 V DC from the GPS module.
   b) passive: The antenna is not supplied with DC voltage from the GPS module.

Note *Longer cables can be used with active antennas.*

2.4 Setting Transmission Frequency

1. Select **TV Settings** > **RF Out** > **Synthesizer**.
   The **Synthesizer** window opens.

2. Under **Frequency**, set the transmitter frequency.

Note *Depending on the TV standard, Frequency is the channel center frequency (DVB), the pilot frequency (ATSC) or the vision carrier frequency (Analog TV).*

2.5 Setting Output Power

Note *The transmitter has an internal power test point which means that in most cases a separate measuring instrument is not necessary.*

1. Select **TV Settings** > **RF Out** > **Amplifier**.

   The **Amplifier** window opens.

2. Under **Output Power**, set the required output power.
3. If necessary, set a warning threshold for low output power under **RF Fail Limit**.

Detailed information is given in the table below:

Setting item	Explanation
Output Power	Used to set the required output power of the transmitter *(the output power should not exceed the specified nominal power)*
RF Fail Limit	Used to set a threshold value in dB for low RF output power. The threshold is referenced to the power output set under Output Power. If the power drops below the set threshold value, an RF Fail fault is generated. *Default setting: -3 dB*

Display	Symbol	Explanation
Actual Power Status	OK	Power display is valid
	W	Power display is invalid The internal power meter of an amplifier is overloaded; the actual output power may be above the displayed power.
RF Fail	- OFF -	RF power at the output of the output stage OK or transmitter switched off
	F	RF power is below the threshold specified under RF Fail Limit
Amplifier	OK	No warning at the output stage
	W	Output stage signals a sum warning

Display	Explanation
Actual Power	Current forward power of the transmitter

2.6 Activating RF

1. Switch off transmission mode by pressing the **RF ON/OFF** key.
2. Connect available interlock loop systems to **X32** (**TX CONTROL**)

   or with low power

   if no interlock loop system is provided, short-circuit **X32** (**TX CONTROL**) using the supplied short-circuit connector.
3. Switch transmission mode on again by pressing the **RF ON/OFF** key.

   Both the **RF ON/OFF** LED and the **RF PRESENT** LED should now light up to indicate that the transmitter is delivering power at the output.

2.7 Checking Status Displays and Clearing Logbook Entries

The status displays can be used to check installation and configuration of the transmitter. If a transmitter is ready to operate, no warnings or errors will be indicated.

Furthermore, it is also recommended to clear existing logbook entries after the transmitter has been put into operation.

1. Check the status menus of your transmitter according to the TV standard you have set.

a) For DVB, select **Status** > **TV DVB** > **Device Status** and then **Status** > **TV DVB** > **Input Status**.

b) For ATSC, select **Status** > **TV ATSC**.

c) For Analog TV, select **Status** > **TV ATV**.

2. Select **Logbook** > **Summary**.

   The **Summary** window opens.

3. In the context menu, select the item **Clear logbook**.

   All logbook entries are cleared.

CHAPTER 5

OPERATING

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1 Introduction to Operation

The R&S SLx8000 transmitter can be operated in the following ways:

– Local operation via the display and menu keys on the front panel of the device
– Operation via the web browser
– Monitoring and control via SNMP

If the device is operated via the web browser of a connected PC/client computer, two modes are possible:

– Remote operation via a directly connected PC
– Remote control via a remote network client

1.1 Authorizations and Menu Levels

There are different authorizations and menu levels for operating the transmitter.

❍ Authorizations define which parameters and configurations you are allowed to change.
❍ The parameters to be selected are on a maximum of four menu levels.

1.1.1 Authorizations

Various authorization levels protect against nondeliberate access of critical system settings from the home menu. When you start local operation via the keypad and display of the transmitter, your user ID is **Operation** by default.

Note *You can change, create or delete user profiles using the user administration facility (called up via the web browser).*

From the **Change User** context menu, you can log on in any menu under a different user ID. When in local operation mode, you do not need to enter a password to change the user ID.

Fig. 1 *Changing user at display in local operation mode*

Note *The fields **Or type user name** and **Type password** are reserved for Rohde & Schwarz Service personnel only.*

The following user profiles are factory-set:

User profile	Explanation
Configuration	Authorization to set basic transmitter parameters; e.g. setup
Maintenance	Authorization to perform maintenance tasks, e.g. software update
Operation	Authorization to make settings that directly affect transmitter operation
Query	Read-only authorization
Guest a)	Read-only authorization *Only with operation via web browser*
Config-Engl	Authorization to set basic transmitter parameters, e.g. setup; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)
Superuser a)	Authorization to configure, create and delete user profiles and to display and delete active sessions; no authorization for setting transmitter parameters; see Query *Only with operation via web browser*

a) The IDs Superuser and Guest are only available via the web browser.

Note *After entering any settings that affect the configuration, please return the authorization level to its lowest possible setting. This will stop unauthorized personnel from entering settings that could impair operation of the transmitter.*

Note *In the event of a power failure, the transmitter resets to the Operation authorization level.*

Local operation mode

Fig. 2 *LOCAL key (with LED) for switching between local and remote operation*

If the transmitter is to be operated locally, it must be set to *local operation* so that changes made to individual menu items using the transmitter keypad and display or via a PC connected to **ETHERNET LOCAL** (**X30**) are accepted.

To switch to local operation, press the **LOCAL** key (the associated LED lights up).

Remote operation

If the transmitter is to be operated remotely, it must be set to *remote operation* so that commands to change settings sent via the **ETHERNET REMOTE** interface (**X31**) are accepted.

To deactivate local operation, press the **LOCAL** key again (the associated LED goes out).

1.2 Local Operation

1. Press the **Local** key so that the associated LED lights up.

   The transmitter is now in local mode and can be operated and configured locally.

2. Press the **HOME** key.

   The system overview appears on the display.

1.2.1 System Overview

Fig. 3 *System overview on R&S SLx8000 display*

1) TV standard
2) Nominal power
3) Status of active input
4) Status of reference input
5) Sum warning display
6) Sum fault display
7) Muting display
8) Display indicating new logbook entries
9) Display indicating connection to higher-level R&S NetCCU800 switchover unit
10) Forward (F) and reflected (R) power, voltage standing wave ratio (VSWR)
11) Display indicating whether transmitter is delivering power

Status displays in system overview

Status	Message	Meaning
Active input	Ok	Valid signal is present at the active input
	W	Signal at the active input is faulty
	F	Signal at the active input is invalid or not detected

Status	Message	Meaning
Reference input	- OFF -	External reference frequency is present and is OK – or – External reference frequency is not present but is not required, either
	Ref F	External reference frequency is not OK and the fail delay time set in the Reference menu has expired
Sum warning	W	One or more warnings are active
Sum fault	F	One or more faults have occurred
Muting display	Mute	RF output signal is disabled by the signal processing unit; the **RF PRESENT** LED does not light up even with **RF ON**
Logbook entries	LoG	New entries have been made in the logbook since the logbook was last opened
NSU connect	Con	Transmitter is connected to a higher-level R&S NetCCU800 switchover unit (NSU)
Status of transmitter output	RF	Transmitter is delivering power
	- OFF -	RF output has been deactivated by the user
	F	Transmitter is not delivering any power

1.2.2 Menu Keys

Fig. 4 *Menu operation*

Key	Meaning / function
OK / MENU	**OK**: – Confirms an entry or selection **MENU**: – In system overview: starts the menu control function – From a menu: calls the context menu

Key	Meaning / function
BACK / HOME	**BACK**: – In a setting window: cancels the entered value, provided that it has not yet been confirmed with **OK** – In menu (general): move one step back in the history **HOME**: – Used to move from the menu tree back to the system overview
CURSOR KEYS	⇦⇨⇧⇩ : Navigation in the menu tree ⇦⇨ : Navigation to a digit in an entered value ⇧⇩ : Increments or decrements a number

A number of keys are assigned two functions. The following applies:

– Press the key briefly = The function indicated on the key is executed
– Press the key longer = The function indicated above the key is executed

1.2.3 Operating Structure

1.2.3.1 Navigation in Menu System

This is how you navigate within the menu system:

1. Press and briefly hold down the **MENU** key.

   The context menu for the system overview is called.

   The context menu for the system overview contains items used to call the **SLX** menu tree, to directly access individual menu paths (shortcuts such as **DVB**, **Logbook** or **System**) as well as the context commands **Reset Fault** for resetting stored error messages and **Change User** for changing the user ID.

Note *When you access the menu system for the first time, you are logged on by default under the user ID **Operation** which authorizes you to make settings that directly affect transmitter operation.*

Fig. 5 *Context menu for system overview*

1) Resets saved error messages
2) Opens the SLx menu tree
3) Shortcut to DVB menu path
4) Too many items to be displayed simultaneously (scroll down using the cursor keys to display other items)

2. *At context level*:

   Use the cursor keys ⇧⇩ to navigate to the required entry item and confirm with **OK**.

   A directory menu with the selected menu tree or menu path is displayed.

Note *The single arrow or double arrow in the top right-hand corner of the menu indicates the direction in which you can scroll the list.*

3. *Within the menu tree*:

   Use the cursor keys ⇧⇩ to select a lower-level menu path or a menu window and confirm with **OK** or ⇨.

Note *Items **with** an arrow pointing to the right lead to lower-level menu paths. Items **without** an arrow symbol open menu windows for setting or displaying parameters.*

Fig. 6 *In menu tree*

1) Path
2) Not all available items are shown on display (here: scroll direction UP)
3) Item opens a menu window
4) Item opens a further menu path

4. *Within a menu window*:

   Use the cursor keys ⇧⇩ to select a parameter and confirm with **OK** to adjust this parameter.

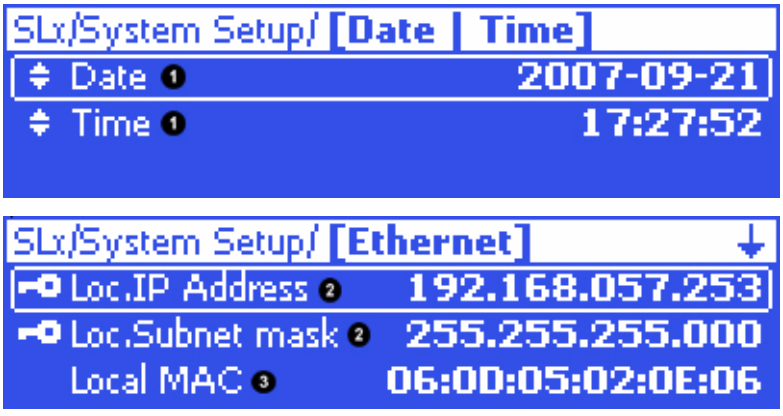


Fig. 7 *Menu window (top: System Setup > Date/Time; bottom: System Setup > Ethernet)*

1) Parameters with double arrow: setting can be changed.
2) Parameters with key symbol: setting not possible because user does not have appropriate authorization or transmitter is in remote operation mode
3) Parameters without symbol: display only, setting not possible

Use the **MENU** key to call a context menu for the currently displayed setting window.

Use the **BACK** key to go back one step in the menu structure (even from the Help windows); you can also use **BACK** to cancel an entered value as long as you have not already confirmed it with **OK**.

Use the **HOME** key to exit the menu structure and return to the system overview.

Alternative method of opening menus

By briefly pressing the **OK** key, you can call the **SLx** menu tree directly from the system overview.

1.2.3.2 Selecting and Editing Settings

Note *Only those parameters identified by a double arrow can be adjusted.*

Selecting settings

Fig. 8 *Selecting value*

1. Select the setting using the cursor keys ⇧⇩.
2. Confirm the selection with **OK**.

   Your setting is saved and displayed in the menu window.
3. Press the **HOME** key to finish menu editing.

Editing settings

In the editor, it is only possible to add new characters to existing characters. To insert characters at a certain position, you must first delete any existing characters from right to left and then enter new characters starting at the current cursor position.

The editor is closed by selecting **Enter text** or **Discard**; you then return to the menu window. If you select the **Fix Editor** command in the context menu, the editor will remain open until you close it by pressing the **Back** key.

Fig. 9 *Entering values*

1) *Entry line*
2) *Selectable characters*
3) *Command line*

1. To enter characters, move to the required character using the cursor keys and then confirm with the **OK** key.

   The selected character appears in the entry line.

   or

   To delete characters in the entry line, select **Del char** using the cursor keys and then confirm with the **OK** key.

   The characters in the entry line are deleted one by one from right to left.

2. To save changes (current entry in the entry line), select **Enter text** using the cursor keys and then confirm with the **OK** key.

   This closes the editor, stores the changes and displays them in the menu window.

   or

   To close the editor without saving the changes, select **Discard** using the cursor keys and then confirm with the **OK** key.

   The editor closes and you return to the menu window. Your changes are not saved.

3. Press the **HOME** key to finish menu editing.

1.2.3.3 Context Menu

The context menu contains function- and content-oriented commands which can be applied to the currently displayed menu.

The context menu can be called from any position using the **MENU** key.

Fig. 10 *Context menu*

The content-oriented commands are given in the description for the respective menu window. The function-oriented commands are listed and described below:

Command	Explanation
Info	Help texts for the respective menu window/menu item
Open	Opens the editor or the selection window for setting the parameters (same effect as pressing the **OK** key)
Edit	Used to edit a menu item (alternative to the **OK** key)

Command	Explanation
Edit Offline	Used to edit a menu item offline; changes are only saved when Submit Changes (context menu) is selected
Submit Changes	Saves changes made offline
Edit Online	Used to edit a menu item online; standard setting which can only be changed by selecting Edit Offline
Function Menu	Not yet implemented
Change User	Used to change the user profile
Logbook	Calls the logbook
System	Not yet implemented
Enter Text	In editor only: used to save entries (alternative to the "Enter text" command in the command line of the editor)
Discard	In editor only: used to discard entries (alternative to the "Discard" command in the command line of the editor)
Fix Editor	In editor only: The editor remains open for further editing after entries have been saved or discarded

1.3 Remote Operation and Remote Control

Remote control (e.g. via a network) and remote operation (e.g. via a PC) both require a web browser.

Note *Depending on their rights, logged-on users can monitor the transmitter or control all of its functions. There is no difference between remote operation and remote control with respect to this functionality.*

The transmitter contains the necessary components for remote operation and remote control as standard:

- Network connection (10/100 Mbit)
- Network card (RJ-45)
- RJ-45 crossover cable

1.3.1 Installation and Configuration

Connecting a PC/network

☞ *Remote operation*: Connect a PC to the **X30** interface (**ETHERNET LOCAL**) of the R&S SLx8000 using an RJ-45 cable.

☞ *Remote control*: Connect the remote monitoring network to the **X31** interface (**ETHERNET REMOTE**) of the R&S SLx8000 using an RJ-45 cable.

Setting IP addresses at transmitter

To allow the R&S SLx8000 to communicate with a local PC or a remote network client, the IP address of the used Ethernet interface of the transmitter must be in the IP subnet of the PC or remote monitoring network.

You can enter the address data required for communication directly via the R&S SLx8000 display.

Note *Alternatively, you can also adapt the IP address of your PC to the subnet of the transmitter under Windows and retain the factory setting for the local network interface X30 (IP address = 192.168.57.253, network mask = 255.255.255.0). In this case, configure the network address of your PC to, for example, 192.168.57.100/255.255.255.0.*

1. On the R&S SLx8000 display, select the **System Setup** > **Ethernet** menu.

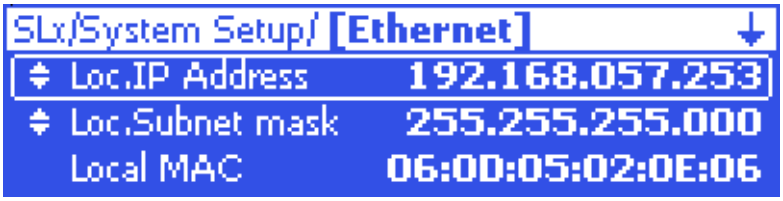


Fig. 11 *Entering IP address data*

2. From the context menu, select the **Edit Offline** mode.
3. Enter the address data for the **X30** local interface under **Loc.IP Address** and **Loc.Subnet mask**.
4. Enter the address data for the **X31** remote-control interface under **Rem.IP Address** and **Rem.Subnet mask**.
5. In the context menu, select **Submit Changes**.

   The changes will be made.

Note *The transmitter must be restarted if the network settings are changed.*

Configuring browser

The following requirements must be fulfilled before you can operate the R&S SLx8000 using your browser:

– Setting of cookies must be enabled
– Scripting of Java applets must be activated
– "Java Platform Standard Edition" must be installed and activated

The next section uses Microsoft Internet Explorer to explain how you can check whether these conditions have been met or what changes you need to make.

Note *Please note that the settings described here need not match your current browser version one hundred percent.*

ATTENTION!
Please note that the modified settings described here may adversely affect the security of your Internet connections.

All necessary changes and settings can be found in the **Tools > Internet Options** menu of your Internet Explorer.

Checking and adapting settings for cookies:

1. Select the **Privacy** tab and click the **Default** button if available and not dimmed.
2. Set the privacy level via the slider (all the way down) to **Accept All Cookies**.

Checking and adapting settings for Java applets:

1. Select the **Security** tab.
2. For the Internet zone, select the **Adapt Level** option.
3. In the tree structure, go to **Scripting > Scripting of Java applets** and select the **Enable** option.

Installing Java (Sun) JRE if necessary; checking and adapting settings

1. Select the **Advanced** tab.
2. Check whether the entry **Java (Sun) JRE ...** is present and enabled.
3. If necessary, download and install (standard installation) the Java Runtime Environment from the Sun website "www.java.com".
4. Then select the Internet Explorer's **Advanced** tab again and check whether the software is installed and enabled.

Launching program

Note *To be able to operate the R&S SLx8000 via a locally connected PC (**X30**), the R&S SLx8000 must be set to local operation (press the **Local** key so that the associated LED lights up).*

1. Start the browser on your PC or network client.
2. Enter the IP address of the Ethernet interface (**X30** or **X31**) via which you are to communicate with the R&S SLx8000.

   The login screen appears.

ID	Authorization	Password
Configuration	Allows you to set basic transmitter parameters; e.g. setup	1234
Maintenance	Allows you to perform maintenance tasks; e.g. software update	1234
Operation	Allows you to make settings that directly affect transmitter operation	1234

ID	Authorization	Password
Query	Read-only authorization	1234
Guest a)	Read-only authorization – see Query	1234
Config-Engl	Same as Configuration authorization; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)	1234
Superuser a)	Allows you to configure, create and delete user profiles and to display and delete active sessions; no authorization for setting transmitter parameters; see Query	1234

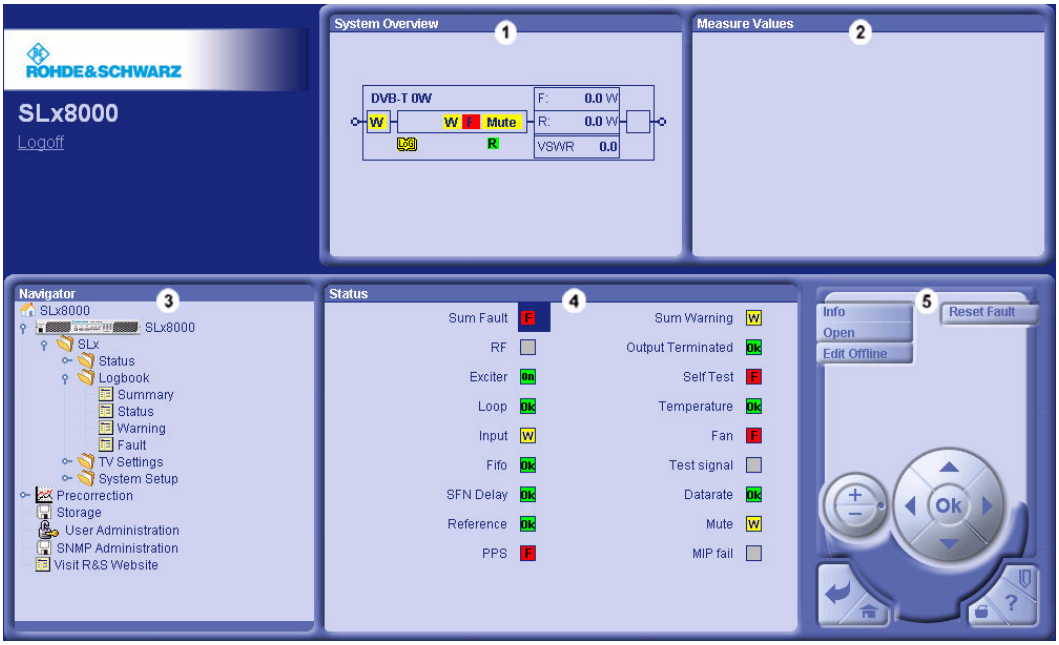
a) The IDs Superuser and Guest are only available via the web browser.

3. Log on using the ID you require and confirm with **OK**.

   The corresponding entry screen appears.

1.3.2 Browser-Based Operation

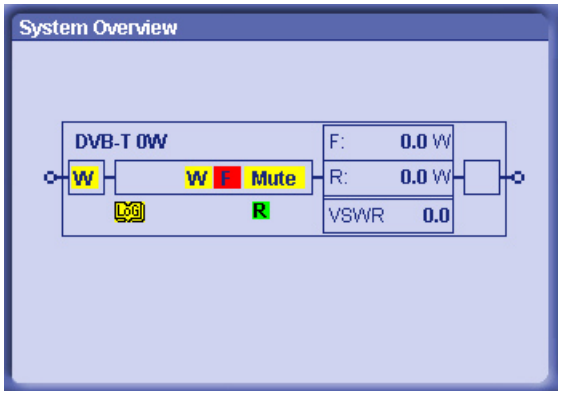
The following entry screen appears after logon:



1) System Overview: current transmitter status
2) Measure Values: displays the forward and reflected power
3) Navigator: display and navigation through the transmitter menus
4) Menu window: displays the menus selected in the navigator
5) Control panel: elements for navigating within the menu system and for displaying and editing the menu entries

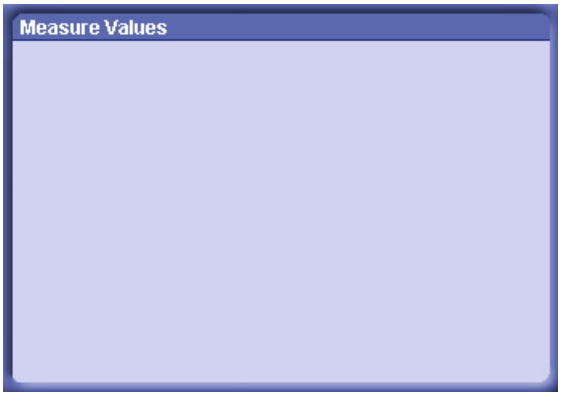
System Overview

The **System Overview** window provides an overview showing the current status of the transmitter and its components.



Measure Values

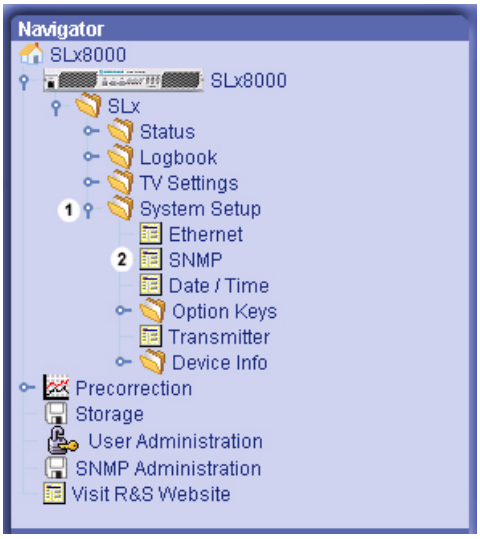
The current forward power and reflected power are displayed in the **Measure Values** window.



Note *The function is to be implemented in a future software release.*

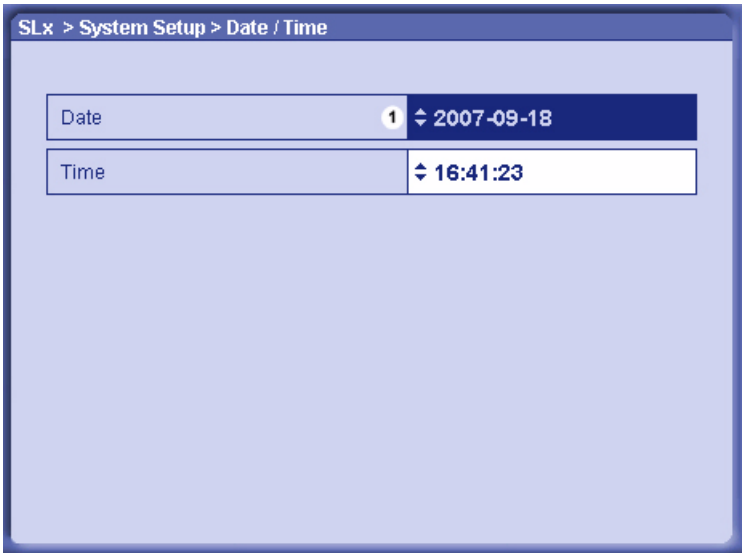
Navigator

The navigator shows the tree structure of all transmitter menus. You can open the individual folders and menus by double-clicking with the mouse. The selected menus are displayed in the menu window.



Menu window

The menu window shows the menu selected in the **Navigator** window.



1) Items with double arrow symbol can be changed

Control panel

You can use the control panel to navigate within the menu structure and menus and to change settings. You activate the individual control elements using the mouse or keyboard.

1) *Used for switching between menu entries, for accessing editable values and for entering numeric values; clicking the arrow buttons (up/down) increments or decrements a number (corresponds to cursor keys on the keyboard)*
2) *Used for editing (switch to edit mode) and confirming settings (corresponds to entry key on the keyboard)*
3) *Corresponds to the UP and DOWN cursor keys*
4) *Used for quickly switching between menu items, for quickly accessing editable values and for quickly entering numeric values; can be rotated using the mouse*
5) *Usually used to move one level back in the menu structure; also used to cancel settings that have not yet been confirmed with OK*
6) *Return to home menu*
7) *Displays the context menus for the current menu window (standard context menus: Description: help texts; Open: opens a menu or menu item; Edit: for editing entry; Edit Offline: item can be edited without the change being applied immediately; Submit Change: submits an item edited offline); see also "Context Menu" under "Local Operation"*
8) *Not enabled in this software version*

1.4 User Administration

The user administration facility is available in conjunction with browser-based operation. The settings that you make in the user administration facility are (provided that no password is required) also valid for menu access via local operation.

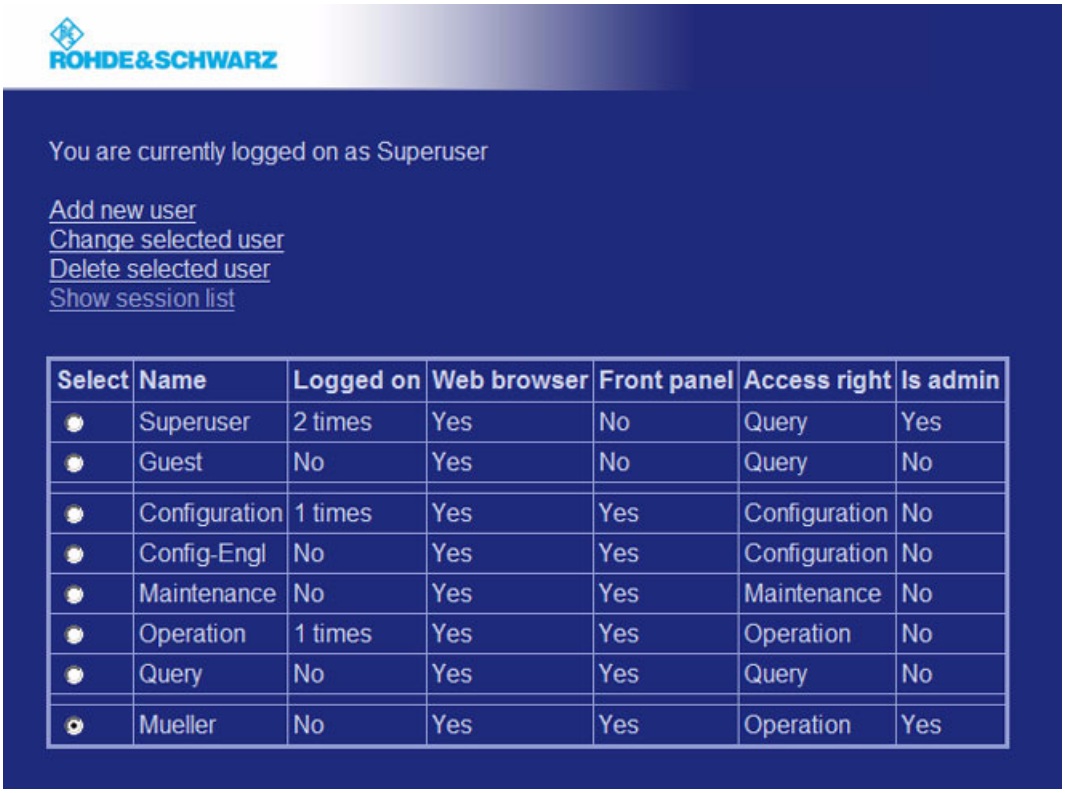
You can use the user administration facility to

– change user profiles (users and access rights)
– create new user profiles
– delete user profiles
– close active sessions

The ID **Superuser** with the factory-set password **1234** gives you extensive user administration rights.

1. Log on as Superuser.
2. Select **User Administration** in the **Navigator** window.

   The processing options and a list of existing users are displayed.



Select	Name	Logged on	Web browser	Front panel	Access right	Is admin
○	Superuser	2 times	Yes	No	Query	Yes
○	Guest	No	Yes	No	Query	No
○	Configuration	1 times	Yes	Yes	Configuration	No
○	Config-Engl	No	Yes	Yes	Configuration	No
○	Maintenance	No	Yes	Yes	Maintenance	No
○	Operation	1 times	Yes	Yes	Operation	No
○	Query	No	Yes	Yes	Query	No
◉	Mueller	No	Yes	Yes	Operation	Yes

Display	Meaning
Select	Selects the user to be processed
Name	User ID
Logged on	The user is not logged on (**No**) or is logged on once/several times (**X times**) at the system
Web browser	The user ID and authorization permit operation via the web browser (**Yes, No**)
Front panel	The user ID and authorization permit local operation (**Yes, No**)
Access right	Authorization to access transmitter parameters
Is Admin	Additional user administration authorization (configuration, creation and deletion of user profiles)

The following users are factory-set. Only the password can be changed for these users.

ID	Authorization	Password
Configuration	Allows you to set basic transmitter parameters; e.g. setup	1234
Maintenance	Allows you to perform maintenance tasks; e.g. software update	1234
Operation	Allows you to make settings that directly affect transmitter operation	1234

ID	Authorization	Password
Query	Read-only authorization	1234
Guest	Read-only authorization – see Query	1234
Config-Engl	Same as Configuration authorization; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)	1234
Superuser	Allows you to configure, create and delete user profiles and to display and delete active sessions; no authorization for setting transmitter parameters – see Query	1234

1.4.1 Creating, Changing and Deleting Users

Creating users

1. Select **Add new user**.

2. Create the required user profile.

Entry/selection	Explanation
Name:	User ID (case-sensitive)
Password:	Must be at least 6 characters in length (case-sensitive)
Retype password:	Enter the password again (case-sensitive)
Web browser	The user ID permits menu access via the web browser
Front panel	The user ID permits local operation
Access right	Selects a factory-set authorization level

Entry/selection	Explanation
Is admin	The user is also given user administration rights (configuration, creation and deletion of users; no access to the user profiles **Superuser** and **Guest**)

3. Confirm your entries with **Add user**; clicking **Reset** discards your entries.

Changing users

Note *All users have the right to change their own password.*

1. Mark the required user.
2. Select **Change selected user**.

3. Change the user profile in the way described under "Creating users".
4. Confirm your changes with **Change User**; clicking **Reset** discards your changes.

Deleting users

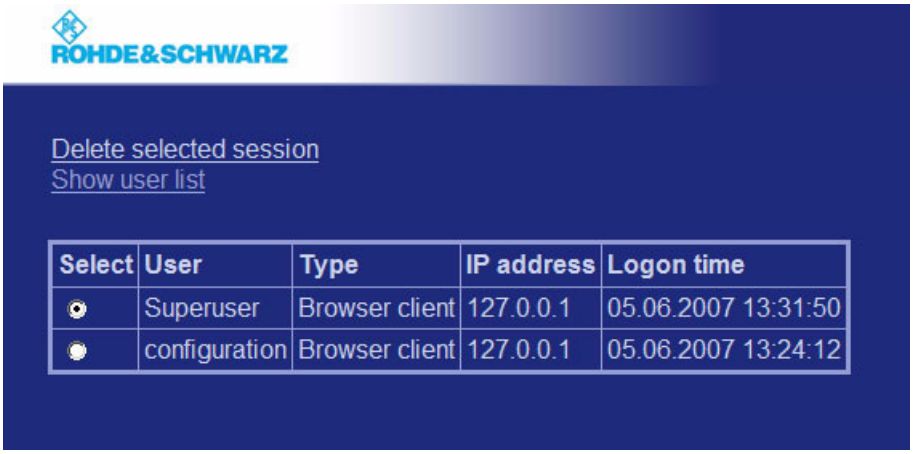
1. Mark the required user.
2. Select **Delete selected user**.

   The user is deleted.

1.4.2 Closing Active Sessions

If you are logged on as Superuser, you can view detailed information on logged-on users and close active sessions.

1. After logging on, select **Show session list**.



2. Mark the session (the user) that you want to close.
3. Select **Delete selected session**.

   The marked session is closed.

4. Return to the previous browser window by clicking **Show user list**.

1.5 Monitoring and Control via SNMP

SNMP (Simple Network Management Protocol) is used for monitoring and controlling a wide variety of different units in a network. Detailed information about this topic can be found under http://www.wikipedia.org/.

A description of the unit - the MIB (Management Information Base) - must be loaded in the central unit ("manager") from which the transmitters are monitored.

A monitored unit contains a program ("agent") which can answer queries from the manager and execute commands. Furthermore, the agent may of its own accord generate a message and send it to the manager. In this way, the central unit can be informed of a fault.

1.5.1 Installation

The MIBs required for monitoring and controlling a transmitter are available in the Rohde & Schwarz firmware/software database GLORIS and can be downloaded at any unit. All of the information required for configuration is contained in the MIBs themselves.

When the transmitter is put into operation, both the agent in the transmitter and the manager must be configured. Additional steps may be necessary if the transmitter is connected via routers, firewalls or similar devices as they may block data packets.

- The XX8000 transmitter family supports the versions SNMPv1 and SNMPv2c.
- Alarms can be sent as v1Traps, v2Traps or v2Informs.
- Several destinations can be set for error messages (alarm sinks).
- Several communities can be set with Read Only authorization and Read/Write authorization.

1.5.1.1 Settings on Transmitter Side

You can make settings yourself via the local display (if available), the web server or SNMP. The menu windows of the **SNMP** menu contain all the settings that are required for accessing a transmitter.

Note *Changes to these settings are adopted immediately. The device does not need to be restarted.*

Note *Detailed information about the individual parameters can be found in the descriptions of the respective menu windows.*

1.5.1.2 Settings on Manager Side

To be able to monitor and control a transmitter with SNMP, the MIB of the device and a program which can interpret the MIB must be available on the manager side.

You can load all available MIBs from any device using a web browser.

1. Log on using the web browser and select the **SNMP Administration** menu.

   MIBs from Rohde&Schwarz and IRT are available. MIBs from IRT allow transmitters to be linked using SNMP irrespective of the manufacturer. They are, however, limited with respect to their functionality. When using IRT MIBs, you can select the "Inhibit Status" for local operation (in the same way as for the parallel contacts). If this function is acti-

vated, no alarms/traps are sent when the transmitter is in local mode. You can activate/deactivate this function using **Inhibit Status** in the **SNMP** > **General** menu window.

The MIBs have the naming convention RS-XX8000-<TV/Radio Standard>-<Standby Concept/Option>-MIB. An example is RS-XX8000-ATV-TX-MIB for signal transmitters for analog TV.

Examples of MIBs and contents:

MIB	Description
RS-COMMON-MIB	Contains general Rohde&Schwarz definitions
RS-XX8000-COMMON-MIB	Contains definitions which all XX8000 transmitters fulfill (e.g. type plate, configuration)
RS-XX8000-DVB-TX-MIB	Contains definitions for DVB single transmitters, passive exciter standby, active and passive output-stage standby
RS-XX8000-DVB-NP1-MIB	Contains definitions for DVB n+1 systems
RS-XX8000-DVB-NTX-MIB	Contains definitions that an R&S NetCCU800 provides as access for n different, independent DVB transmitters
RS-XX8000-DVB-TX-REC-MIB	Contains definitions for the optional DVB receiver in a transmitter
RS-XX8000-DVB-NP1-REC-MIB	Contains definitions for the optional DVB receiver(s) in an n+1 system
RS-XX8000-FM-TX-MIB	Contains definitions for FM single transmitters with passive exciter standby and active and passive output-stage standby
RS-XX8000-FM-NP1-MIB	Contains definitions for FM n+1 systems
RS-XX8000-ATV-TX-MIB	Contains definitions for analog TV single transmitters with passive exciter standby and active and passive output-stage standby
RS-XX8000-ATV-NP1-MIB	Contains definitions for analog TV n+1 systems

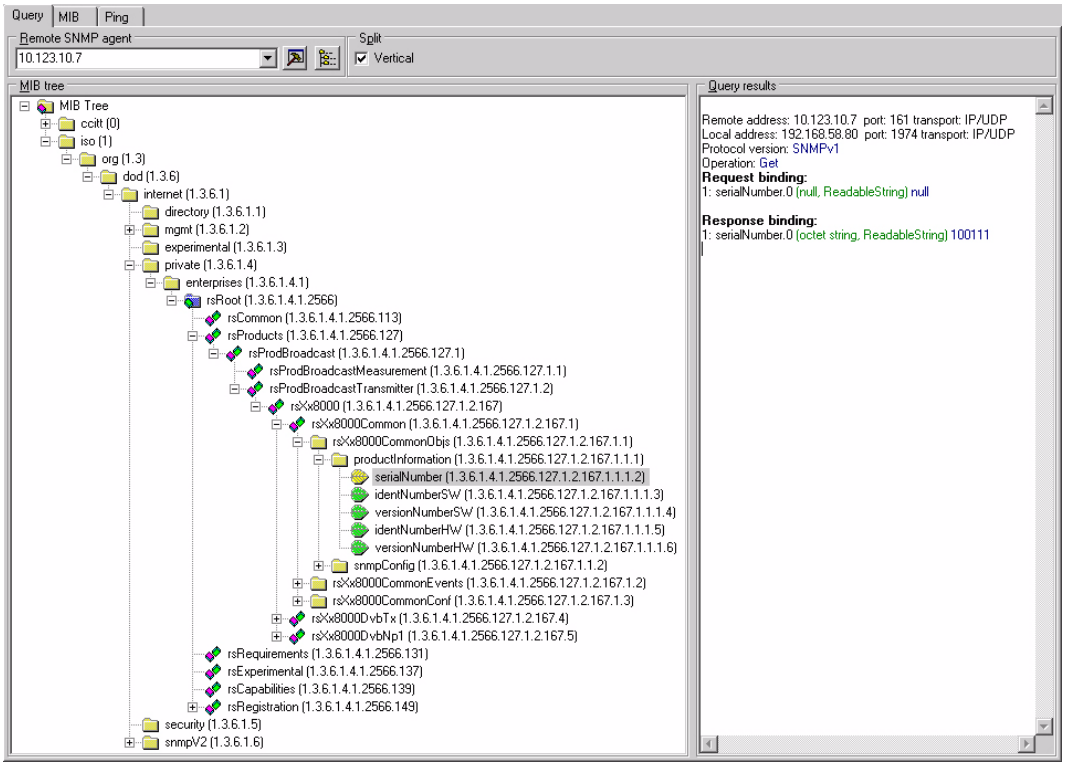
2. Save the required ZIP file to your PC.
3. Load the following MIBs:
   a) RS-COMMON-MIB
   b) RS-XX8000-COMMON-MIB
   c) MIB of the standby concept or option

A detailed description of the MIBs, the information that they contain and the associated options is given below.

1.5.1.3 Testing SNMP Communication

SNMP communication is properly set up if you have loaded the MIBs in your program and you are using the correct IP address of the transmitter and the correct community. For queries and settings you must set the SNMP version in your manager; the transmitters detect the used protocol automatically.

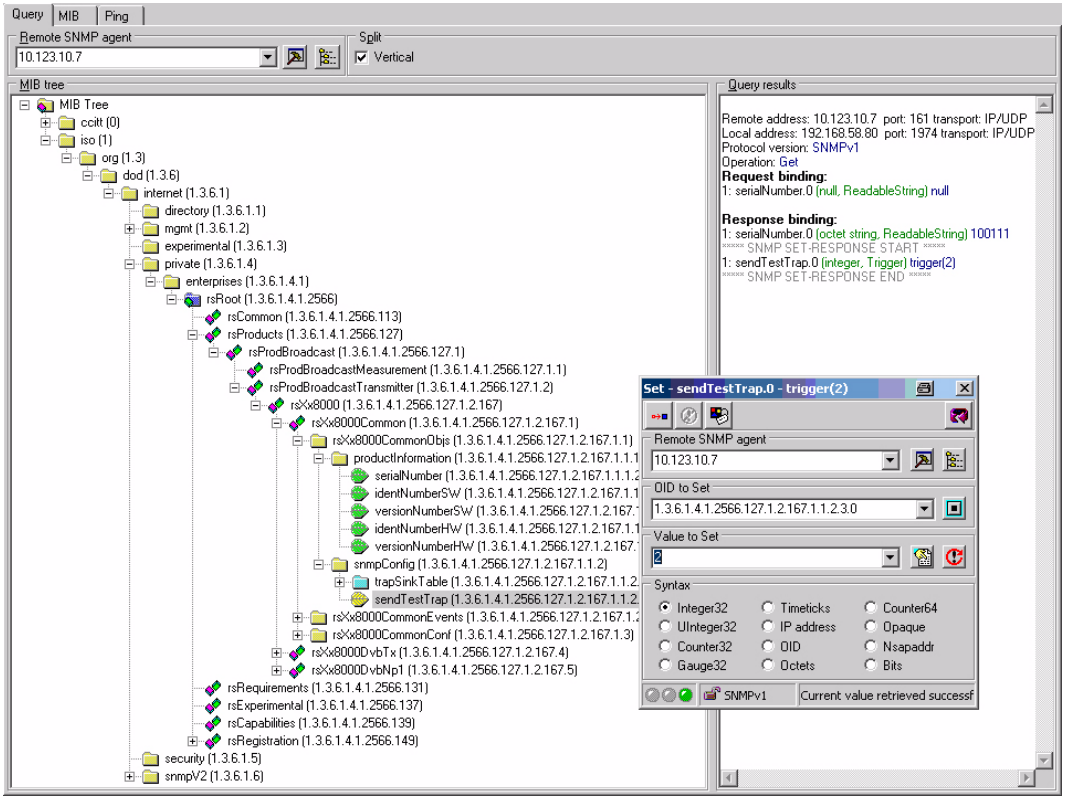
The following query can be used as a simple test:



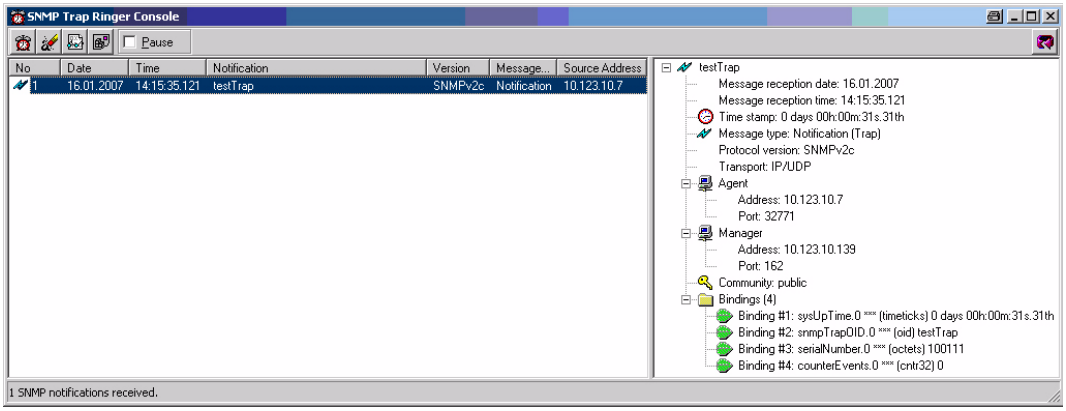
In the example above, a transmitter with the IP address 10.123.10.7 queries the OID (ObjectIdentifier: unique designation of a data point) **serialNumber** (.1.3.6.1.4.1.2566.127.1.2.167.1.1.1.2). The reply from the agent is **100111**.

Using a further test, you can check whether the transmitter sends an alarm message in the event of an error and whether this message reaches the alarm destinations. To do so, set an OID **sendTestTrap** (.1.3.6.1.4.1.2566.127.1.2.167.1.1.2.3) to the value **2**, which triggers a **testTrap** (.1.3.6.1.4.1.2566.127.1.2.167.1.2.0.1). This alarm is sent to all receivers which have been entered for the alarms (Trapsinks, see above).

This type of error message functions using a slightly different mechanism than that used for querying and setting values (standard: UDP Port 161 for SET/GET and UDP Port 162 for alarms).



The following illustration shows that the **testTrap** has been received correctly by the unit with the serial number **100111**.



Known problems

If querying of the data does not work or if you do not receive an alarm, check the following:

- Has the network been connected correctly? Does the SNMP connection function using only the remote Ethernet interface of the device (R&S NetCCU800: **X5** – **NETLINK**, R&S Sx800: **X2** – **ETHERNET**, R&S SLx8000: **X32** – **ETHERNET REMOTE**)?
- Are the network settings (IP address, gateway) correct?
- Is the correct community entered for access in the manager and in the transmitter (case-sensitive)?
- Is a PC firewall blocking incoming SNMP packets?

– Has the program which receives alarms been started and correctly configured?
– In large networks: Is a router or firewall blocking the SNMP packets?
– Is message suppression (**Inhibit Status** in the **SNMP** > **General** menu) activated?

1.5.1.4 Configuration

This chapter provides an overview of the available properties.

RS-XX8000-COMMON-MIB

This MIB contains general data that supports every unit:

– type plate: serial number, software version, etc
– SNMP configuration: table for alarm destinations and alarm versions
– triggering of a test trap
– counter for counting the transmitted traps
– list of the alarm messages last transmitted
– parameters which are used in several other MIBs

This information always concerns the unit that is being monitored by means of SNMP, for example the NSU in an n+1 system.

RS-XX8000-DVB-TX-MIB

This MIB contains the parameters for:

– the standby concepts "single transmitter", "passive exciter standby", "active output-stage standby" and "passive output-stage standby"
– all power classes (low-power, medium-power and high-power)
– air-cooled and liquid-cooled transmitters

Different parameters are available depending on the system being queried. For example, **cmdTxOpModeExcAutomatic** (.1.3.6.1.4.1.2566.127.1.2.167.4.1.1.1.7) gives the reply **NoSuchName** if you query a single transmitter since this transmitter does not have an automatic exciter function. It is easy to find out which parameters are valid by checking the "module compliances" (e.g. under .1.3.6.1.4.1.2566.127.1.2.167.4.5.2).

Example: DVB configuration, passive exciter standby, medium power, optional DVB receiver module with two inputs.

Valid MIBs:

– RS-COMMON-MIB
– RS-XX8000-COMMON-MIB
– RS-XX8000-DVB-TX-MIB
– RS-XX8000-DVB-TX-REC-MIB

The valid OIDs for the transmitter are contained in the "Module Compliance" path. The OID contains references to the individual groups.

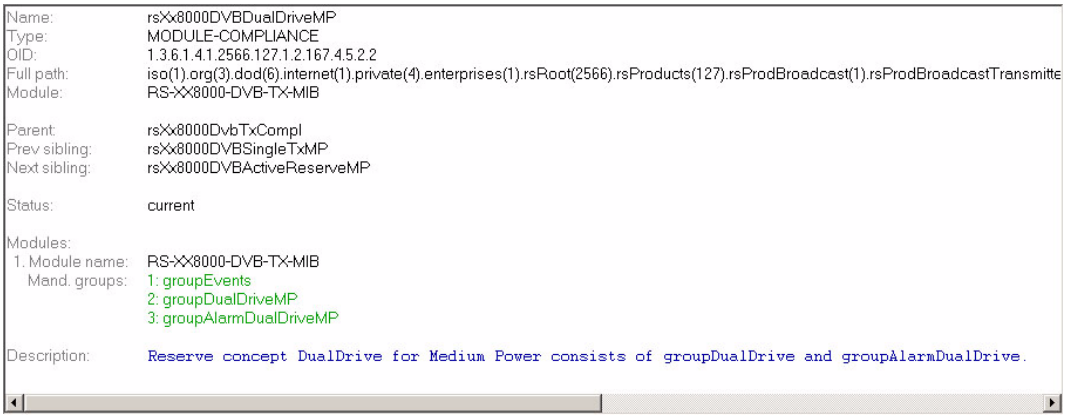


Fig. 12 *RS-XX8000-DVB-TX-MIB*

1) Name and OID for DualDrive MediumPower
2) Reference to groupEvents - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.1
3) Reference to groupDualDriveMP - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.4
4) Reference to groupAlarmDualDriveMP - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.5

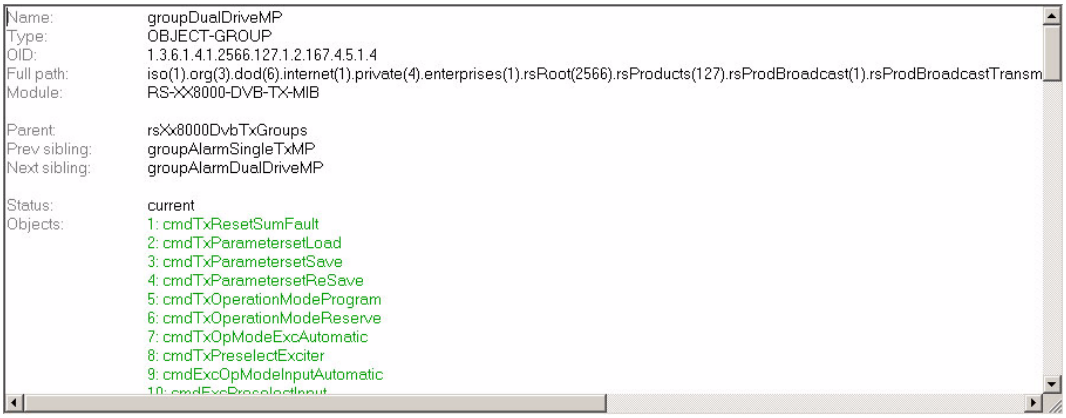


Fig. 13 *List of parameters (excerpt) for groupDualDriveMP*

1) Name and OID for DualTuner
2) Reference to groupDualTuner - 1.3.6.1.4.1.2566.127.1.2.167.2.5.1.3
3) groupAlarmDualTuner - 1.3.6.1.4.1.2566.127.1.2.167.2.5.1.5

The groups contain all valid OIDs. The valid OIDs for the receiver module are contained in the "Module Compliance" path of the RS-XX8000-DVB-TX-REC-MIB. The OID contains references to the individual groups. The groups contain all valid OIDs.

RS-XX8000-DVB-NP1-MIB

This MIB contains all the parameters required for any DVB n+1 system, irrespective of the following features of the individual transmitter:

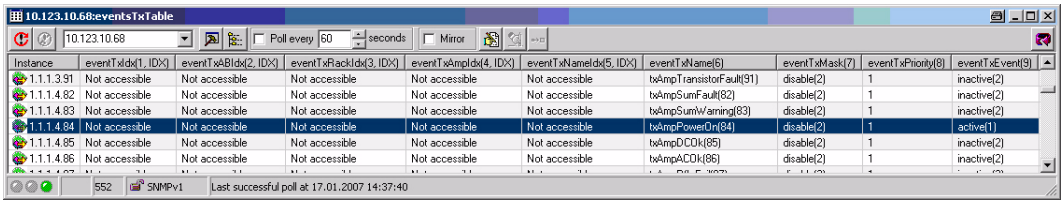
– variant
– power class
– cooling system

Once again, unavailable parameters receive the reply **NoSuchName**, e.g. parameters from the transmitter A8 if only a 4+1 system is available (see module compliances under .1.3.6.1.4.1.2566.127.1.2.167.5.5.2).

Setting alarms

The transmitter-specific alarms offer an extensive range of configuration possibilities.

Depending on the available system, it is possible to set detailed alarms: for example, for every item of status information in every amplifier in every rack of every transmitter in a medium-power n+1 system. In addition, it is also possible to assign a freely selectable priority and to check the current status.


10.123.10.68:eventsTxTable
10.123.10.68
Poll every 60 seconds
Mirror
Instance | eventTxIdx(1, IDX) | eventTxABIdx(2, IDX) | eventTxRackIdx(3, IDX) | eventTxAmpIdx(4, IDX) | eventTxNameIdx(5, IDX) | eventTxName(6) | eventTxMask(7) | eventTxPriority(8) | eventTxEvent(9)
1.1.1.3.91 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpTransistorFault(91) | disable(2) | 1 | inactive(2)
1.1.1.4.82 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpSumFault(82) | disable(2) | 1 | inactive(2)
1.1.1.4.83 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpSumWarning(83) | disable(2) | 1 | inactive(2)
1.1.1.4.84 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpPowerOn(84) | disable(2) | 1 | active(1)
1.1.1.4.85 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpDCOk(85) | disable(2) | 1 | inactive(2)
1.1.1.4.86 | Not accessible | Not accessible | Not accessible | Not accessible | Not accessible | txAmpACOk(86) | disable(2) | 1 | inactive(2)
552
SNMPv1
Last successful poll at 17.01.2007 14:37:40

In the illustration above, the following information is contained in the highlighted row (depending on the used MIB; here: DVB n+1 medium-power system):

Position of code number	Meaning of position	Value	Meaning of value
1	Transmitter	1	Transmitter TxB
2	Output stage	1	Output stage A
3	Transmitter rack	1	Transmitter rack No. 1
4	Amplifier	4	Amplifier No. 4
5	Event	84	Amplifier ON/OFF

Tab. 1 *"Instance" column (1.1.1.4.84) in numeric order*

Column	Meaning	Value	Explanation
eventTxName(6)	Designation of event	txAmpPowerOn(84)	Amplifier ON/OFF
eventTxMask(7)	Message for event	disable(2)	No alarm is sent
eventTxPriority(8)	Priority for event	Value freely selectable by customer	Default setting when supplied: 1
eventTxEvent(9)	Current status of amplifier	active(1) (inactive(2))	Amplifier ON (Amplifier OFF)

Tab. 2 *Meaning of other columns*

The columns containing the value **Not accessible** are "index" columns (identified by **IDX**). OIDs of these columns cannot be queried; they are used for internal purposes only.

Example: DVB, N+1, low power

Valid MIBs:

– RS-COMMON-MIB
– RS-XX8000-COMMON-MIB
– RS-XX8000-DVB-NP1-MIB

Valid OIDs in "Module Compliance" path for N+1 low power:

– Name: rsXx8000DVBNplus1LP
– OID: 1.3.6.1.4.1.2566.127.1.2.167.5.5.2.2

Groups:

– groupNsuLP - 1.36.1.4.1.2566.127.1.2.167.5.5.1.6
– groupAlarmNsuLP" - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.7
– groupTxLP - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.8
– groupAlarmTxLP - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.9
– groupEvents - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.5

2 Menu Structure

The transmitter software branches to different navigation areas. The main area SLx is also accessible via the SLx8000 display, whereas the other areas are only available using the web browser.

Navigation areas of transmitter software

- SLx
- Precorrection
- Storage
- User Administration
- SNMP Administration
- User Manual

Note *The following description of the menus in the SLx menu tree is based on local operation using the display and menu keys.*

2.1 SLx Menu Tree

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
Status >				
	TV DVB >			
		Device Status		3.2
		Input Status		3.3
	TV ATV			3.4
	TV ATSC			3.5
Logbook >				4
	Summary			
	Status			
	Warning			

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
	Fault			
TV Settings >				
	Input >			
		TS1-HP		5.1
		TS2-LP		5.2
		Input Automatic		5.3
		VF		5.4
		Sound >		
			Input B|G, D|K, I, M1	5.5.3
			Input M, N	5.5.4
			Input M, N BTSC	5.5.5
			Input NICAM Mod	5.5.6
			Input NICAM Cod	5.5.7
	RF Out >			
		Amplifier		6.1
		Synthesizer		6.2
		Output		6.3
		IQ Adjust		6.4
		Precorrection		6.5
	DVB >			
		Common		7.1
		TPS		7.2
		SFN Delay		7.3
		Test Signals		7.4
	ATSC >			
		Common		8.1
		Input Config		8.2
		Input Automatic		8.3
	ATV >			
		Common		9.1

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
		Vision >		
			White Control	9.2.1
			White Limiter	9.2.2
			Sync Pulse	9.2.3
			Equalizer	9.2.4
		Sound >		
			FM Audio Mode	9.3.1
			FM Carrier	9.3.2
			FM Precorrection	9.3.3
			NICAM Audio Mode	9.3.4
			NICAM Carrier	9.3.5
	Reference >			
		Common		10.1
		GPS >		
			Status	10.2.1
			Satellites	10.2.2
System Setup >				
	Ethernet			11.1
	SNMP >			
		General		11.2.1
		Manager		11.2.2
		Alarmsinks		11.2.3
	Date / Time			11.3
	Option Keys > (web browser only)			
		Status		11.4.1
		Install		11.4.2
		Deactivations		11.4.3
	Transmitter			11.5
	Device Info >			

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
		Device		11.6.1
		Boards >		11.6.2
			Coder	
			RF Board	
			Amplifier	
			GPS	

2.2 Menu Path "Precorrection"

The navigation area is the interface to the precorrector GUI (integrated software for transmitter precorrection with individual web interface).

Level 1 >	Level 2 >	Level 3 >	Parameter
Precorrection > a)			Setting items: – Start Precorrector-GUI

a) The precorrector GUI starts as a JAVA applet in its own window.

2.3 Menu Item "Storage"

Level 1 >	Level 2 >	Level 3 >	Parameter
Storage > a)			Setting items: – Save parameter settings into file – Recall parameter settings from file

a) When double-clicking the menu item, a new browser window will be opened.

2.4 Menu Item "User Administration"

Level 1 >	Level 2 >	Level 3 >	Parameter
User Administration > a)			Setting items: – Add new user – Change selected user – Delete selected user – Show session list

a) Clicking the menu item opens a new browser window.

2.5 Menu Item "SNMP Administration"

Level 1 >	Level 2 >	Level 3 >	Parameter
SNMP Administration> a)			Setting items: – Please click here to download MIBs (provided by IRT).

a) When double-clicking the menu item, a new browser window will be opened.

2.6 Menu Item "User Manual"

Level 1 >	Level 2 >	Level 3 >	Parameter
User Manual > a)			Links to PDF download: – Deutsches Benutzerhandbuch – English User Manual

a) Clicking the menu item opens a new browser window.

3 Status of Transmitter: "Status" Menu

The **Status** menu provides an overview of faults, warnings and status messages relating to the individual components and functions of the transmitter.

The status displays can vary depending on the set TV standard.

The **Status** menu branches to the following menu windows:

- **TV DVB** > **Device Status**: Information about the current status of the DVB transmitter
- **TV DVB** > **Input Status**: Information about the configuration and status of the DTV input interfaces
- **TV ATV**: Information about the current status of the ATV transmitter and ATV input interfaces
- **TV ATSC**: Information about the current status of the ATSC transmitter and DTV input interfaces

3.1 Status Displays, Warnings and Error Messages

When warnings and error messages occur, this usually means that transmission operation is impaired. Different displays are used to distinguish the severity of an impairment or the "quality" of a defect. The following applies:

	FPNL	WebGUI	
Status display	OK	OK [green]	There is no impairment.
Warning	W	W [yellow]	Although the exciter is functional, it is possible that external influences are disrupting transmission operation.
Error message	F	F [red]	A severe fault has occurred; transmission is usually impossible.

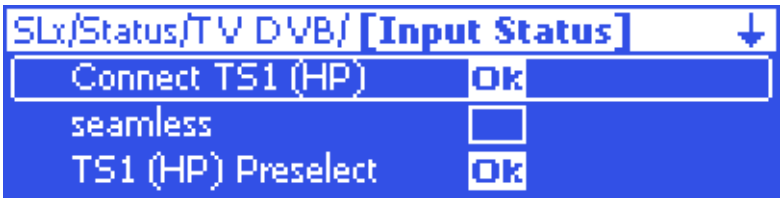
Note *This type of "LED" display using abbreviations (OK, W, F, etc) and color (web browser only) is used throughout the entire menu.*

3.2 Status > TV DVB > Device Status

Display	LED	Explanation
Sum Fault	F	Sum fault message: One or more faults have occurred.
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	There is no RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter	On	RF output of the exciter is enabled There are several options for enabling the RF output: – using the setting item **RF Output** in the **RF Out** > **Output** menu – using the **RF ON/OFF** key on the front panel of the SLx8000
Loop	Ok	RF interlock loop is closed
	- OFF -	RF interlock loop is not closed
Input	OK	Valid transport stream is present on the active input *In the case of hierarchical coding, the input is OK if valid transport streams are present at both inputs (for HP stream and LP stream).*
	W	Invalid transport stream at the active input (associated with the setting **Type of Loss of Input** = *Warning*, see the section "TV Settings > Input > Input Automatic")
	F	Invalid transport stream at the active input (associated with the setting **Type of Loss of Input** = *Fault*, see the section "TV Settings > Input > Input Automatic")
FIFO	W	Overflow or underflow of the input buffer due to incorrectly configured DVB transmission parameters. Possible reasons: – incorrect data rate of the input data stream – variations in the input data rate are too great (bursts)
SFN Delay	W	Desired time of transmission in the SFN cannot be complied with. Possible reasons: – the maximum delay set at the MIP inserter is too small for the (current) transmission link – incorrect reference signal (GPS)
Reference	OK	External reference frequency is present and is OK
	W	External reference frequency is not OK
	F	External reference frequency is not OK and the fail delay time set in the **TV Settings** > **Reference** > **Common** menu has expired
	- OFF -	External reference frequency is not present but is not required, either
PPS	OK	External 1 PPS source is present and the reference frequency is synchronized with the 1 PPS

Display	LED	Explanation
	W	External 1 PPS source is not present or the reference frequency is not synchronized with the 1 PPS
	F	External 1 PPS source is not present or the reference frequency is not synchronized with the 1 PPS, and the fail delay time set in the **TV Settings** > **Reference** > **Common** menu has expired
	- OFF -	External 1 PPS source is not present and is not required, either
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly
	F	One or more necessary software options are not enabled
Sum Warning	W	One or more warnings are active
Output Terminated	OK	RF output is terminated
	F	Cable-break sensor reports that the RF output is not terminated
Self Test	OK	No hardware faults have been detected
	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating
Test Mode	W	Transmitter has been switched to test mode
Datarate	W	Wrong data rate on the active input *In the case of hierarchical coding, a warning is output if an incorrect data rate is present at one or both inputs.*
Mute	W	RF signal is disabled by the signal processing unit in the exciter
MIP	W	No MIP at active input. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: no MIP in the input data stream and the setting **TPS Source** > **MIP** has been selected in the **TV Settings** > **DVB** > **TPS** menu window *In the case of hierarchical coding, the LED lights up if both inputs (for the HP stream and LP stream) are affected.*

3.3 Status > TV DVB > Input Status



Display	LED	Explanation
Connect TS1 (HP)	OK	Input signal is present at TS 1
	- OFF -	No input signal present at TS 1
seamless		Indicates the status of seamless input switchover for TS 1 (seamless switching) *Seamless switching is activated/deactivated using the Seamless Switching switch in the TV Settings > Input > Input Automatic menu window.*
	On	Operating input and standby input are synchronized
	- OFF -	Inputs cannot be synchronized
TS1 (HP) Preselect	OK	TS 1 is the preselected operating input
	- OFF -	TS 1 is the standby input
TS1 (HP) active	OK	TS 1 is currently the active input
	- OFF -	TS 1 is currently the inactive input
MIP TS1 (HP)	W	No MIP at input TS 1. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: no MIP in the input data stream and the setting **TPS Source** > **MIP** has been selected in the **TV Settings** > **DVB** > **TPS** menu window
	- OFF -	MIP is present
Connect TS2 (LP)	OK	Input signal is present at TS 2
	- OFF -	No input signal present at TS 2
seamless		Indicates the status of seamless input switchover for TS 2 (seamless switching) *Seamless switching is activated/deactivated using the Seamless Switching switch in the TV Settings > Input > Input Automatic menu window.*
	On	Operating input and standby input are synchronized
	- OFF -	Inputs cannot be synchronized

Display	LED	Explanation
TS2 (LP) Prese-lect	OK	TS 2 is the preselected operating input
	- OFF -	TS 2 is the standby input
TS2 (LP) active	OK	TS 2 is currently the active input
	- OFF -	TS 2 is currently the inactive input
MIP TS2 (LP)	W	No MIP at input TS 2. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: no MIP in the input data stream and the setting **TPS Source** > **MIP** has been selected in the **TV Settings** > **DVB** > **TPS** menu window
	- OFF -	MIP is present

3.4 Status > TV ATV

Display	LED	Explanation
Sum Fault	F	Sum fault message: One or more faults have occurred
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	There is no RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter	On	RF output of the exciter is enabled There are several options for enabling the RF output: – using the setting item **RF Output** in the **RF Out** > **Output** menu – using the **RF ON/OFF** key on the front panel of the SLx8000
Loop	Ok	RF interlock loop is closed
	- OFF -	RF interlock loop is not closed
Video In	OK	Valid video signal is present at the input
	W	Invalid video signal at the input

Display	LED	Explanation
	F	No video signal at the input
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly
	F	One or more necessary software options are not enabled
Sum Warning	W	One or more warnings are active
Test Mode	W	Transmitter has been switched to test mode
HW Error	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating
Output Terminated	OK	RF output is terminated
	F	Cable-break sensor reports that the RF output is not terminated

Display	Status	Explanation
		Displays the set audio mode:
Audio Mode	Mono	Mono
	Stereo	Stereo
	Dual	Dual sound
Carrier 1	Off	Sound carrier 1 is not present in the RF output signal
	Mod Off	Modulation for sound carrier 1 has been switched off in the ATV > Sound > FM Carrier menu
	AF1+2	Carrier is modulated with the signals AF1 and AF2
	BTSC	Carrier is modulated with BTSC
	AF1	Carrier is modulated with the signal AF1
Carrier 2	Off	Sound carrier 2 is not present in the RF output signal
	Mod Off	Modulation for sound carrier 2 has been switched off in the ATV > Sound > FM Carrier menu

Display	Status	Explanation
	AF1+2	Carrier is modulated with the signals AF1 and AF2
	N/A	Status unknown
	N/A	Status unknown
	AF1	Carrier is modulated with the signal AF1
	AF1-2	Carrier is modulated with the signals AF1 and AF2
	AF2	Carrier is modulated with the signal AF2
	AF1/P	Carrier is modulated with signal AF1 as well as the pilot tone
	AF1-2/P	Carrier is modulated with the signals AF1 and AF2 as well as the pilot tone
	AF2/P	Carrier is modulated with signal AF2 as well as the pilot tone
	N:AF1+0	NICAM carrier is modulated with the signal AF1 only
	N:AF1+2	NICAM carrier is modulated with the signals AF1 and AF2
	N:Digital	Carrier is modulated with a NICAM 728 data stream
	N:PRBS	Carrier is modulated with PRBS

3.5 Status > TV ATSC

Display	LED	Explanation
Sum Fault	F	Sum fault message: One or more faults have occurred.
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	There is no RF level at the exciter output since the RF output is not enabled ("manually" disabled)

Display	LED	Explanation
Exciter	On	RF output of the exciter is enabled There are several options for enabling the RF output: – using the setting item **RF Output** in the **RF Out** > **Output** menu – using the **RF ON/OFF** key on the front panel of the SLx8000
Loop	Ok	RF interlock loop is closed
	- OFF -	RF interlock loop is not closed
Input	OK	Valid transport stream is present on the active input *In the case of hierarchical coding, the input is OK if valid transport streams are present at both inputs (for HP stream and LP stream).*
	W	Invalid transport stream at the active input (associated with the setting **Type of Loss of Input** = *Warning*, see the section "TV Settings > Input > Input Automatic")
	F	Invalid transport stream at the active input (associated with the setting **Type of Loss of Input** = *Fault*, see the section "TV Settings > Input > Input Automatic")
Input [1/2] Connect	OK	Input signal is present at the input **TS 1/TS 2**
	W	Input signal has not been detected
	- OFF -	Input is not present at the input **TS 1/TS 2**
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly
	F	One or more necessary software options are not enabled
Reference	OK	External reference frequency is present and is OK
	W	External reference frequency is not OK
	F	External reference frequency is not OK and the fail delay time set in the **TV Settings** > **Reference** > **Common** menu has expired
	- OFF -	External reference frequency is not present but is not required, either
Sum Warning	W	One or more warnings are active
Output Terminated	OK	RF output is terminated
	F	Cable-break sensor reports that the RF output is not terminated
Self Test	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook

Display	LED	Explanation
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating
Active Input	1	TS 1 is currently the active input
	2	TS 2 is currently the active input
Datarate	W	Wrong data rate on the active input
Test Mode	W	Transmitter has been switched to test mode

4 Event Memory: Logbook Menu

The logbook is used to record changes in state (events) of the transmitter.

Menu windows

The **Logbook** menu branches to the following menu windows:

– **Summary**: Complete logbook with all recorded data
– **Status**: Partial logbook with recorded status changes
– **Warning**: Partial logbook with recorded occurrences of warnings
– **Fault**: Partial logbook with recorded occurrences of error messages

4.1 Logbook > Summary/Status/Warning/Fault

The complete logbook and the partial logbooks are uniformly structured. The messages are numbered sequentially and contain the following information:

– Identification for occurrence ⇧ or disappearance ⇩ of an event
– Message: Brief description of the event
– Time: Time of day of the event
– Date: Date of the event

Date and time of an event on transmitter display

1. To display the date and time, select a message and call the info window by pressing **OK**.

2. Press **Back** to close the info window and to return to the normal logbook view.

4.2 Logbook Context Menu

Additional context functions are available in the menu windows for the complete logbook and the partial logbooks:

Function	Explanation
Clear logbook	Clears all entries in the current logbook; clearing individual logbook entries is not possible. *When you clear the complete logbook, the partial logbooks are also cleared. A Reset Fault is triggered at the same time.*
Restore logbook	Restores the cleared entries in the current logbook. *When you restore the complete logbook, the partial logbooks are also restored.*

5 Input Parameters: TV Settings > Input Menu

The menu windows in the **TV Settings** > **Input** menu are used to set the parameters for signal processing in the ADTV coder.

Menu windows/menu paths

The **TV Settings** > **Input** menu branches to the following menu windows and menu paths:

- **TS1-HP** (DTV only): Used to configure the input data stream at **TS 1** (with hierarchical coding: High Priority); displays the data format, packet length and data rate
- **TS2-LP** (DTV only): Used to configure the input data stream at **TS 2** (with hierarchical coding: Low Priority); displays the data format, packet length and data rate
- **Input Automatic** (DTV only): Used to preselect the operating input, configure the automatic input switchover and set the behavior in the event of failure of the input signal
- **VF** (ATV only): Used to set the video input
- Menu path **Sound** (ATV only): Used to set audio inputs

5.1 TV Settings > Input > TS1(HP)

Setting item	Explanation
Presel. Mode	Used to set the data format for the data stream at input **TS 1** The options are as follows: – AUTO: Data format is detected automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream

Display	Explanation
Packet Length	Displays the packet length detected at input **TS 1**
Measured Data Rate	Displays the *data rate measured* at input **TS 1** without null packets Displayed in bits per second (bps)

Display	Explanation
Required Data Rate	Display for checking the measured data rate. The *maximum data processing rate* is displayed. Displayed in bits per second (bps)
Active Mode	Displays the data format detected or set at input **TS 1**: – ASI: as described – SMTPE: as described – Auto: Auto is selected and no data stream is present

5.1.1 Checking Measured Data Rate

By comparing the displays **Measured Data Rate** and Required Data Rate, it is possible to check that the input buffers (FIFOs) are neither overflowing nor underflowing (both cases would result in transmission interruptions).

Maximum data processing rate in MFN mode

In MFN mode all null packets are first of all removed from the transport stream. The associated useful data rate is measured and displayed under **Measured Data Rate**. Trouble-free operation is possible provided that this measurement value remains below the value for **Required Data Rate**.

Note *After the useful data rate has been measured, stuffing to the required data rate is performed, i.e. the difference between **Required Data Rate** and **Measured Data Rate** is compensated by inserting null packets.*

Required data rate in SFN mode

In SFN mode the incoming transport stream is passed to processing unchanged. The data rate is measured and displayed under **Measured Data Rate**. Trouble-free operation is possible provided that this measurement value matches the **Required Data Rate** (± 1 bps).

5.2 TV Settings > Input > TS2(LP)

Setting item	Explanation
Presel. Mode	Used to set the data format for the data stream at input **TS 2** The options are as follows: – AUTO: Data format is detected automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream

Display	Explanation
Packet Length	Displays the packet length detected at input **TS 2**
Measured Data Rate	Displays the *data rate measured* at input **TS 2** without null packets Displayed in bits per second (bps)
Required Data Rate	Display for checking the measured data rate. The *maximum data processing rate* is displayed. Displayed in bits per second (bps)
Active Mode	Displays the data format detected or set at input **TS 2**: – ASI: as described – SMTPE: as described – Auto: Auto is selected and no data stream is present

5.2.1 Checking Measured Data Rate

The information relating to input **TS 1** also applies here.

5.3 TV Settings > Input > Input Automatic (DTV only)

Setting item	Explanation
Preselect Input	Used to preselect the active input – INPUT 1: Operating input is **TS 1**. – INPUT 2: Operating input is **TS 2**.

Setting item	Explanation
Autoswitch	Used to switch *automatic input switchover* on or off In the event of a failure at the (active) operating input, automatic switchover to the standby input takes place. The automatic switchover mode is defined by the following parameter settings.
Seamless Switching	Used to switch seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. *The function has no effect when automatic input switchover is deactivated.*
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Normally, it is not possible to switch back to a failed operating input following a switchover. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place, the system switches back to the preselected operating input as soon as the signal reappears.
Check Time Forward	Used to set a delay time (0 to 60 s) which must elapse before the standby input becomes active following failure of the operating input.
Check Time Back	Used to set a delay time (0 to 60 s) which must elapse before the (now active) standby input is switched back over to the preselected operating input. *The function has no effect if the priority mode is set to EQUAL.*
On Loss Of Input	Used to set the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed – Mute: Suppression of the output signal when the data rate is incorrect
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed.
Fail Delay Time	Used to set a delay time which must elapse following an input signal failure before a sum fault is generated.

5.3.1 Automatic Input Switchover

The transmitter has an automatic switchover function which, in the event of a signal failure, switches the transmitter from one input to the other input (provided that a valid input signal is available at the standby input). Before a failure occurs, the preselected input is active.

The way in which this automatic switchover function operates is determined by the following factors:

– Automatic switchover: ON or OFF (**Autoswitch**)
– Delay times which must elapse before the switchover is performed (**Check Time Forward** and **Check Time Back**)
– Priority mode: Inputs have the same priority or the preselected inputs have priority (**Priority**)
– Operating and standby inputs synchronized or not synchronized (in conjunction with **Seamless Switching**)

Automatic input switchover ON/OFF

If automatic switchover is OFF, the preselected input remains active even if the input signal fails.

If automatic switchover is ON and there is a failure at the preselected input, switchover to the associated standby input takes place.

Priority mode PRIO (input priority)

Following a switchover of the preselected input, the automatic system switches back to this priority input as soon as a signal reappears. Switchover is delayed for the set delay times.

If the signal fails at both the operating input and the standby input, the priority input remains active.

Priority mode EQUAL (equal input priority)

Following a switchover of the preselected input, the standby input with the same priority remains active until the input signal fails on this input also. The automatic system switches back to the preselected input, but only if a signal is present on it once again. Switchover is delayed for the set delay times.

Note *Selecting this operating mode keeps to a minimum the number of switchover operations and in certain cases the number of breaks in transmission (in the case of unsynchronized input streams).*

Note *Automatic input switchover is not available with hierarchical coding.*

5.3.2 Behavior with Defective Input Signal

The behavior in the event of a defective input signal can be influenced using the **On Loss Of Input** switch:

– **Mute**: The output signal of the transmitter is suppressed as soon as synchronization with the input signal (from the operating input *and* standby input) is no longer possible.
– **No Mute**: The output signal of the transmitter is not suppressed even though the input signal is defective. However, when this happens only null packets are transmitted.

5.4 TV Settings > Input > VF (ATV only)

Setting item	Explanation
Nominal Input Amplitude (Vpp)	Used to select the nominal *input amplitude*, either 0.7 V_{pp} or 1 V_{pp} for 75 Ω in each case

Display	Explanation
Clipping	Indicates the status of input signal clipping; the indications are as follows: – No status display: Input signal is within the valid range (NO CLIPPING) – Yellow: Input signal is just off a limit boundary (NO HEADROOM) – Red: Input signal is limited (CLIPPING)

5.4.1 Input Amplitude

Nominal input amplitude

At the nominal input amplitude, a nominal signal with 30% S and 70% noncomposite components is assumed. All of the percent indications which follow with reference to the amplitude relate to the selected input amplitude and a nominal signal.

Permissible input amplitude

The maximum permissible deviation of the input amplitude from the nominal amplitude is equal to ±50%. A smaller input amplitude can result in no vision signal being detected or the quality data not being complied with.

For a larger input amplitude, the input signal can be clipped during analog/digital conversion. This will cause signal components to be lost. Clipping of the input signal is indicated using the **Clipping** status indicator.

In addition, the input signal may have superimposed on it an interference signal with frequencies up to 300 Hz and a peak voltage of a maximum of 30% of the input amplitude as well as white noise that is band-limited to 6 MHz with a maximum level of –26 dBm.

Current input amplitude

The current input amplitude is measured in a selected scanning line in which the white pulse is located. The measured values for the current sync pulse amplitude and the white pulse amplitude can be displayed.

– Selecting the scanning line: see "TV Settings > ATV > Vision > White Control"
– Displaying the measurement values: see "TV Settings > ATV > Vision > Sync Pulse"

5.5 TV Settings > Input > Sound Menu (ATV only)

The menu windows in the **TV Settings** > **Input** > **Sound** menu are used to set the parameters for audio signal processing in the ADTV coder according to the respective standard.

Menu windows

The **TV Settings** > **Input** > **Sound** menu branches to the following menu windows:

– **Input B|G, D|K, I, M1**: Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
– **Input M, N**: Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
– **Input M, N BTSC**: Used to set the nominal input level for the BTSC signal
– **Input NICAM Mod**: Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
– **Input NICAM Cod**: Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis (FM and NICAM) and the low-pass filter (FM)

5.5.1 Input Level at Analog Audio Coder

Nominal input level

The nominal input level determines the level of a sinusoidal signal with a frequency of 500 Hz for which the set nominal deviation (see the "FM deviation" section) will occur with the preemphasis switched off.

Permissible input level

The AF inputs may be overdriven by a maximum of +4 dB starting over the nominal input level. In case of higher input levels, the input signal will be clipped by the A/D converter. This will cause certain signal components to be lost.

This clipping helps to avoid overdriving the following units. The threshold is set so that no clipping occurs during normal operation.

5.5.2 Input Level at NICAM Coder

Nominal input level

The nominal input level is determined for a 2 kHz sinewave signal with 0 dBm in accordance with the NICAM specification.

In the case of input levels deviating from the nominal input level, an appropriate gain or loss (negative values) can be set for signals AF1 and AF2 under **Gain Adjustment NICAM**.

Permissible input level

If the input levels are set as described under "Nominal input level", the drive reserves defined in the NICAM specification will be available.

If the drive reserves are exceeded, the input signal will be clipped by the A/D converter. This will cause certain signal components to be lost. This is indicated by the **Input Clipping NICAM** status displays for inputs AF1 and AF2.

5.5.3 TV Settings > Input > Sound > Input B|G, D|K, I, M1

Setting item	Explanation
Nominal Level [AF1 / AF2]	Used to set the *nominal input level* for the AF signal AF1 or AF2
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2]	Indicates the current *input level at the FM sound modulator* for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.

5.5.4 TV Settings > Input > Sound > Input M, N

Setting item	Explanation
Nominal Level [AF1]	Used to set the *nominal input level* for the AF signal AF1
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1]	Indicates the current *input level at the FM sound modulator* for the AF signal AF1 as a percentage of the maximum drive level
Input Clipping [AF1]	If the AF signal AF1 exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.

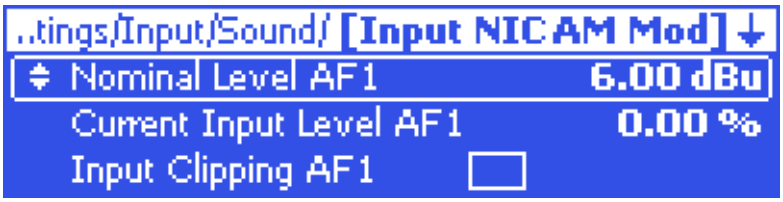
5.5.5 TV Settings > Input > Sound > Input M, N BTSC

Setting item	Explanation
Nominal Level [BTSC]	Used to set the *nominal input level* for the BTSC signal

Display	Explanation
Current Input Level [BTSC]	Indicates the current *input level at the FM sound modulator* for the BTSC signal as a percentage of the maximum drive level

Display	Explanation
Input Clipping [BTSC]	If the BTSC signal exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.

5.5.6 TV Settings > Input > Sound > Input NICAM Mod



Setting item	Explanation
Nominal Level [AF1 / AF2]	Used to set the *nominal input level* for the AF signal AF1 or AF2
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2]	Indicates the current *input level at the FM sound modulator* for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.
NICAM 728 Datastream	Indicates that a NICAM 728 data stream is present

5.5.7 TV Settings > Input > Sound > Input NICAM Cod

Setting item	Explanation
Nominal Level FM/ NICAM [AF1 / AF2]	Used to set the *nominal input level* for the AF signal AF1 or AF2
Gain Adjustment NICAM [AF1 / AF2]	Used to adapt the nominal input level for the AF signal AF1 or AF2 which is fed to the integrated NICAM coder
Preemphasis [FM]	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Preemphasis [NICAM]	Used to switch the pre-emphasis required by the TV standard on or off for NICAM sound
Lowpass [FM]	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level FM [AF1 / AF2]	Indicates the current *input level at the FM sound modulator* for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Current Input Level NICAM [AF1 / AF2]	Indicates the current *input level at the NICAM coder* for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping FM [AF1/AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible *input level*, the amplitude is limited. This is signaled by the Input Clipping status display.
Input Clipping NICAM [AF1 / AF2]	If the AF signal AF1 or AF2 is amplified beyond the permissible *input level at the NICAM coder*, the amplitude is limited. This is signaled by the Input Clipping NICAM status display.

6 RF Generation: TV Settings > RF Out Menu

The menu windows in the **TV Settings** > **RF Out** menu are used to enter settings for output power, frequency generation, modulation and RF monitoring.

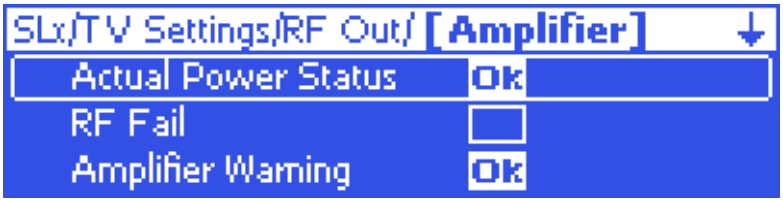
Menu windows

The **TV Settings** > **RF Out** menu branches to the following menu windows:

- **Amplifier**: Used to set and display the output power and to display faults and warnings
- **Synthesizer**: Used to set the channel frequency
- **Output**: Used to enable the RF output, precorrect the amplitude-frequency response of downstream components; with ATV: used to set the sound carrier level and to adjust the residual carrier
- **IQ Adjust**: Used to adjust the modulator
- **Precorrection**: Used to switch the entire linear and nonlinear precorrection on or off

6.1 TV Settings > RF Out > Amplifier

The **Amplifier** menu window is used to adjust and display the power output and to signal a low output power.



Setting item	Explanation
Output Power	Used to set the required output power of the transmitter *(the output power should not exceed the specified nominal power)*
RF Fail Limit	Used to set a threshold value in dB for low RF output power. The threshold is referenced to the power output set under Output Power. If the power drops below the set threshold value, an RF Fail fault is generated. *Default setting: -3 dB*

Display	Symbol	Explanation
Actual Power Status	OK	Power display is valid
	W	Power display is invalid The internal power meter of an amplifier is overloaded; the actual output power may be above the displayed power.
RF Fail	- OFF -	RF power at the output of the output stage OK or transmitter switched off
	F	RF power is below the threshold specified under RF Fail Limit
Amplifier	OK	No warning at the output stage
	W	Output stage signals a sum warning

Display	Explanation
Actual Power	Current forward power of the transmitter

6.2 TV Settings > RF Out > Synthesizer

Setting item	Explanation
Frequency	Used to set the transmission frequency
Frequency Offset	If a frequency offset exists, it is added directly to the transmission frequency (DVB only) The frequency offset transferred in the MIP is addressed to a specific transmitter in the network and is only evaluated if the Tx address set in the TV Settings > DVB > Common menu window identifies the correct receiver. Additionally, to allow display and activation, Tx Automatic must be activated under TV Settings > DVB > Common.

6.3 TV Settings > RF Out > Output

Setting item	Explanation
RF Output	Enables (On) or disables (Off) the RF output
RF Slope	Used to correct asymmetry of the amplitude-frequency response in the spectrum in order to precorrect the output stage and filter
Modulation Slope	Used to correct curvature of the amplitude-frequency response in the spectrum in order to precorrect the output stage and filter
Vision/Sound Carrier 1	Used to set sound carrier level 1 referenced to the peak envelope power of the vision carrier (Analog TV only)
Vision/Sound Carrier 2	Used to set sound carrier level 2 referenced to the peak envelope power of the vision carrier (Analog TV only)
Residual Carrier	Used to set the residual carrier in percent

6.4 TV Settings > RF Out > IQ Adjust

When the transmitter is delivered, the I/Q modulator is factory-adjusted so that no customer intervention is normally required. If further I/Q adjustment is needed at a later time, the **RF OUT** > **IQ Adjust** menu window provides the associated setting options.

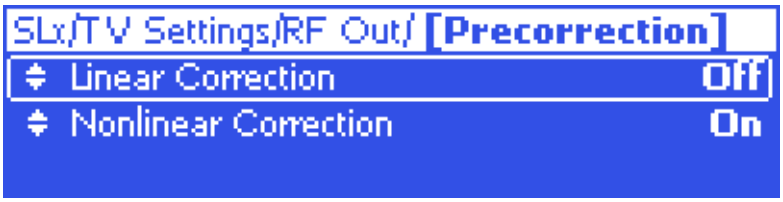
Note *The chapter "Maintenance" describes how to perform I/Q adjustment.*

Setting item/ display	Explanation
I/Q Testsignal	Used to switch a test signal on or off so that I/Q adjustment can be performed manually

Setting item/ display	Explanation
Auto I/Q Adjust	Automatic I/Q adjustment The switch offers the following options: – Start: Starts automatic I/Q adjustment. The calculation takes approx. 5 minutes. During this time ("Calc" is displayed), the RF output signal is suppressed. – Break: Immediately stops the adjustment procedure. The modulator must then be adjusted again in all cases. ***Important**: The transmitter must have been in operation for at least 30 minutes before I/Q adjustment is performed. During adjustment, transmitter parameters must not be changed.* The values for the actuators Bias Coarse, Bias Fine, Gain and Phase determined during automatic I/Q adjustment are displayed under the setting items of the same name for manual adjustment. *If I/Q adjustment is performed again, it is only valid for the currently set transmission frequency. If the transmission frequency is then changed, the factory-set adjustment values apply again.*
Bias Coarse [I/Q]	Coarse adjustment and display of an actuator for suppressing the unwanted center carrier
Bias Fine [I/Q]	Fine adjustment and display of an actuator for suppressing the unwanted center carrier
Gain [I/Q]	For setting and displaying an actuator for suppressing the unwanted carrier in the sideband
Phase	For setting and displaying an actuator for suppressing the unwanted carrier in the sideband

Display	Explanation
Automatic I/Q Adjust Status	Indicates the status of automatic I/Q adjustment: – In Progress: Adjustment has been started; calculation is currently being performed. – Adjusted: After adjustment has been completed, the display changes from "In Progress" to "Adjusted". This status is valid until a new and automatic I/Q adjustment is carried out. The "Adjusted" display does not necessarily mean that the modulator is (currently still) adjusted. – Not Adjusted: A fault occurred during the last adjustment procedure. The automatic I/Q adjustment has to be repeated. If the automatic I/Q adjustment is still not functioning after several attempts, contact technical support.

6.5 TV Settings > RF Out > Precorrection



Setting item	Explanation
Linear Correction	Switches linear precorrection on or off completely
Nonlinear Correction	Switches nonlinear precorrection on or off completely

7 DVB Settings: TV Settings > DVB Menu

The menu windows in the **TV Settings** > **DVB** menu are used to (pre)set the DVB transmission parameters required for coding and modulation and to check the used (TPS) settings (TPS = Transmission Parameter Signaling) which are signaled during transmission.

Note *Providing there is a MIP (Megaframe Initialization Packet) in the transport stream, TPS information can also be read out and used for configuring the DVB transmission parameters. In this case the signaled parameters may not be the same as the manually preset parameters.*

Menu windows

The **TV Settings** > **DVB** menu branches to the following menu windows and menu paths:

- **Common**: Used to select the digital TV standard, the network operating mode and the TPS source, to switch Tx Automatic on and off, to signal the cell ID in the TPS, and to set the Tx address
- **TPS**: Used to select the TPS source, to enter (pre)settings manually; displays the active TPS parameters
- **SFN Delay**: For displaying and setting signal delay times in the SFN
- **Test Signals**: Used to configure DVB transmission parameters for test mode

7.1 TV Settings > DVB > Common

Setting item	Explanation
Digital Standard	Used to select the digital TV standard: DVB-T or DVB-H
Network Mode	Used to select the network operating mode: SFN or MFN
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets *The TPS source can also be set in the TV Settings > DVB > TPS menu window.*
Cell ID Enable	Used to switch cell ID signaling on or off in the TPS The cell ID itself is set in the TV Settings > DVB > TPS menu window. It can also be retrieved from the MIP. The Cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set.

Setting item	Explanation
Tx Address	Used to set the transmitter address; address range: 0 to 65535 Setting the transmitter address is a precondition to reading Tx information (transmitter-specific settings) from the MIP. However, the information is only used if Tx Automatic is enabled.
Tx Automatic	Used to switch Tx Automatic on or off If Tx Automatic is activated (and the transmitter address is set), the following Tx parameters are retrieved from the MIP: Time Offset, Frequency Offset and Cell ID

Display	Explanation
Amplifier Control	Indicates the status of amplifier control

7.2 TV Settings > DVB > TPS

Selection of the TPS source

The **TPS Source** switch is used to select the source for the TPS parameters:

– **MIP**: The TPS information is to be retrieved from the MIP
– **Manual Presets**: The TPS parameters are to be manually configured

Manual configuration of TPS parameters

Parameters for DVB-T, DVB-H and hierarchical coding which are identified by **Manual** can be configured. These manual settings are active in the following cases:

– When there is no MIP in the transport stream.
– When there is a MIP in the transport stream, but this is not used because the TPS source is set to **Manual Presets**.

Displaying active TPS parameters

Active identifies the active (and indicated) TPS parameters. There are also two displays for the required data rates at one or two active inputs (see the section "Checking Measured Data Rate").

If the TPS information from the MIP is used, the values displayed under **Active** may not be the same as the manual settings (**Manual**).

Overview of parameters

Setting item	Explanation
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets

Display/ setting item	Explanation of active or manually set TPS parameters
Bandwidth	Signal bandwidth Display/setting: 5, 6, 7 or 8 MHz
FFT Length	IFFT length Display/setting: 2k or 8k; also 4k for DVB-H
Guard Interval	Guard interval Display/setting: 1/4, 1/8, 1/16 or 1/32
Constellation	Modulation mode Display/setting: QPSK, 16QAM or 64QAM *With hierarchical coding*, the value refers to the sum of constellation points from HP and LP Stream; possible values are therefore: 16QAM or 64QAM
Alpha	*Hierarchical parameter*α Display/setting: – No Hier: no hierarchical coding – 1 H: hierarchical coding with α = 1 – 2 H: hierarchical coding with α = 2 – 3 H: hierarchical coding with α = 3 1 H, 2 H or 3 H activates the hierarchical coding mode. However, this is only possible if Constellation is set to 16QAM or 64QAM.
Cell ID	Cell ID Display/setting: 0x0000 to 0xFFFF The cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set in the TV Settings > DVB > Common menu. For the purpose of signaling in the output signal (TPS), the Cell ID Enable parameter must also be activated in the TV Settings > DVB > Common menu.
Interleaver	Interleaver Display/setting: – nat: Default setting ("native") with standard function for DVB-T – in depth: 8k interleaving for DVB-H with IFFT lengths of 2k and 4k to improve transmission reliability (*DVB-H parameter*)

Display/ setting item	Explanation of active or manually set TPS parameters
Code Rate [HP/LP]	Internal code rate (separate for HP and LP stream) Display/setting: 1/2, 2/3, 3/4, 5/6 or 6/7
Time Slicing [HP/LP]	Time slicing flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: A flag is set in the broadcast DVB signal. This flag informs the receiver that at least one service in the DVB-H data stream uses time slicing.
MPE FEC [HP/LP]	MPE FEC flag (*DVB-H parameter*) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: This flag informs the receiver that at least one service in the DVB-H data stream uses the forward error correction for MPE (Multi Protocol Encapsulation).
Req. Data Rate [HP/LP]	Displays the data rate required at the input for the currently active TPS settings (see the TV Settings > Input > TS1(HP) menu and the TV Settings > Input > TS2(LP) menu)

7.3 TV Settings > DVB > SFN Delay

All transmitters in a single-frequency network (SFN) must transmit the same information at the same time and at the same frequency (single-frequency condition). A number of delay times occur prior to transmission at the antenna, defining the individual time of transmission at the transmitter station.

The **SFN Delay** menu window can be used to check the individual delay times. This makes it possible to check whether the single-frequency condition is met.

Display	Explanation
Maximum Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the transmitter antenna for regular transmission. This delay is set in the MIP inserter and is the default for all transmitters of the SFN.
Network Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the input of the exciter. This delay depends on the used transmission path.
Processing Delay	Minimum turnaround time of the signal by the exciter. This delay depends on the DVB transmission parameters.

Display	Explanation
Dynamic Delay	Time by which signal processing is delayed artificially in order to achieve the required time of transmission.
Total Delay	Actual turnaround time of the signal by the exciter. This time is the sum of Processing Delay plus Dynamic Delay.
Tx Offset Delay	Positive or negative offset (transferred in the MIP for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. This delay is only displayed and activated if Tx Automatic has been activated and the Tx address of the transmitter is correct. *If Tx Offset Delay and Static Delay are present at the same time, their effects are added together.*

Setting item	Explanation
Static Delay	Positive or negative offset (set manually for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. The Static Delay is used to compensate differences between transmission systems from different manufacturers. *If Static Delay and Tx Offset Delay are present at the same time, their effect is added together.*
Max Deviation Time	Maximum deviation in the calculated time of transmission which can be corrected without interrupting transmission. Default setting: 10 µs

7.3.1 Distribution of Delays on Timeline

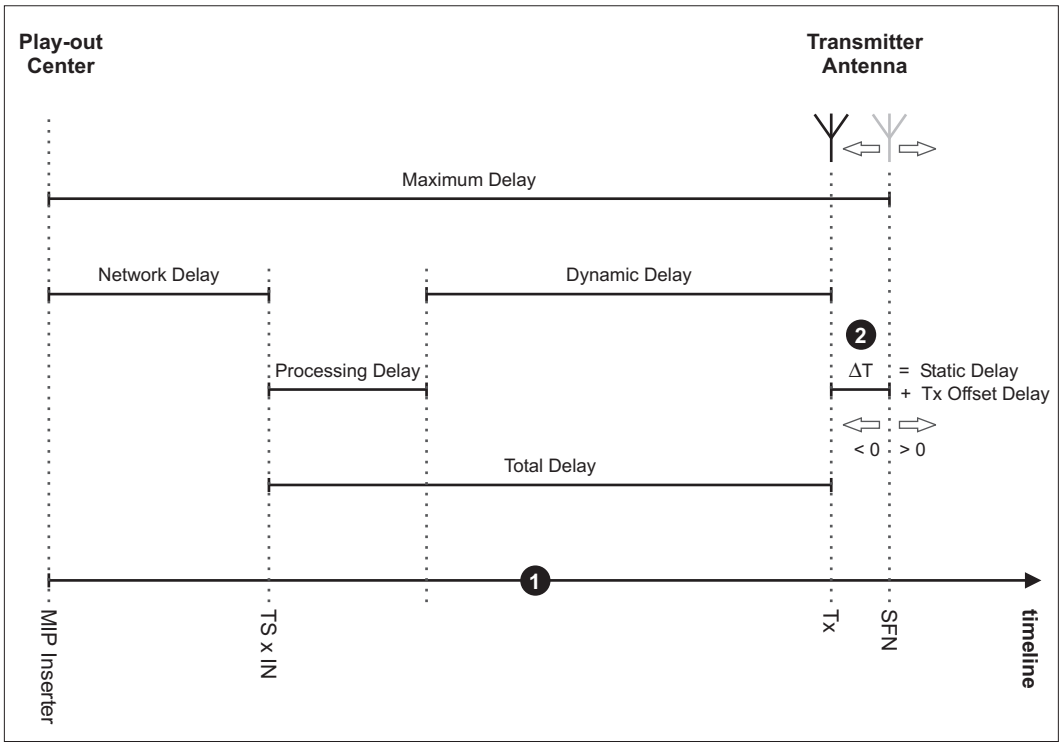


Fig. 14 *Delays in SFN*

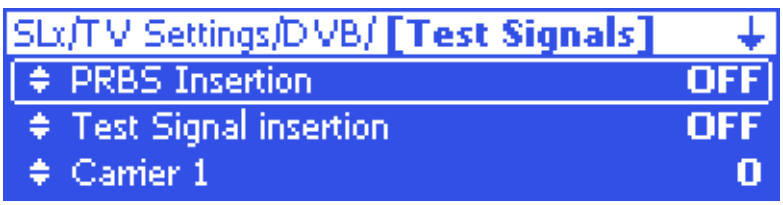
1) Timeline showing the defined times for signal insertion (MIP Inserter), signal feed to the exciter (TS x IN), time of transmission at the station (Tx) and regular time of transmission (SFN)
2) ΔT = Difference between the individual time of transmission of the station and the regular time of transmission in the SFN; with negative sign in the example

Using the information in the MIP and the measured signal processing time, the microcontroller calculates the dynamic delay for the planned time of transmission.

Note *In order to comply with the single-frequency condition, the value of the dynamic delay must be between 0 and 1 second.*

7.4 TV Settings > DVB > Test Signals

The **Test Signals** menu window is used to generate test signals.



Setting item	Description
PRBS Insertion	Insertion of a PRBS sequence instead of the transport stream present at the input Selection: – OFF: Normal operating status, test sequence not active – 2^23-1, 2^15-1 or 2^9-1: Displayed PRBS sequence selected
Test Signal Insertion	Insertion of unmodulated test carriers or suppression of modulated carrier ranges in the output frequency spectrum Selection: – OFF: Normal operating status, test signal not active – CARRIER 1: Insertion of an unmodulated test carrier at carrier position 1 – CARRIER 2: Insertion of an unmodulated test carrier at carrier position 2 – C1 and C2: Insertion of two unmodulated test carriers at carrier position 1 and carrier position 2
	– BANDPASS: Suppression of the modulated carriers from position 0 to carrier position 1 and from carrier position 2 to the end of the frequency spectrum – BANDSTOP: Suppression of the modulated carriers in the range between carrier position 1 and carrier position 2 In the BANDPASS and BANDSTOP functions, the value for carrier 1 must be smaller than the value for carrier 2.
Carrier 1	Sets the position for test carrier 1
Carrier 2	Sets the position for test carrier 2

7.4.1 Arrangement of Test Signals in Output Frequency Spectrum

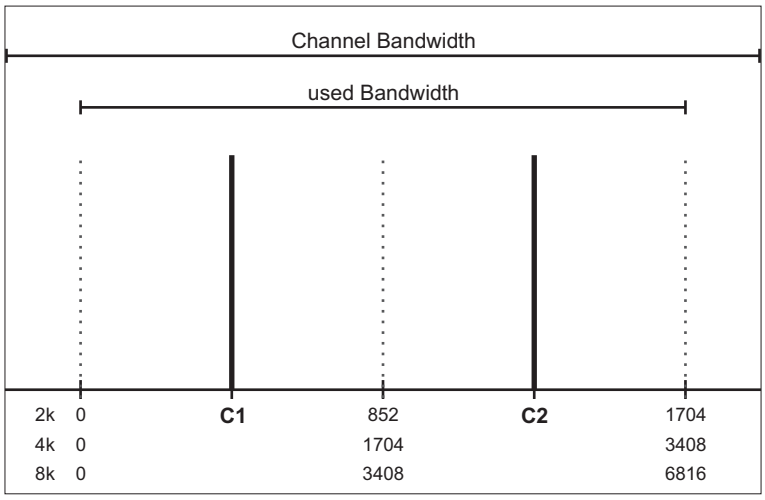


Fig. 15 *Test Signal Insertion function | C1 and C2*

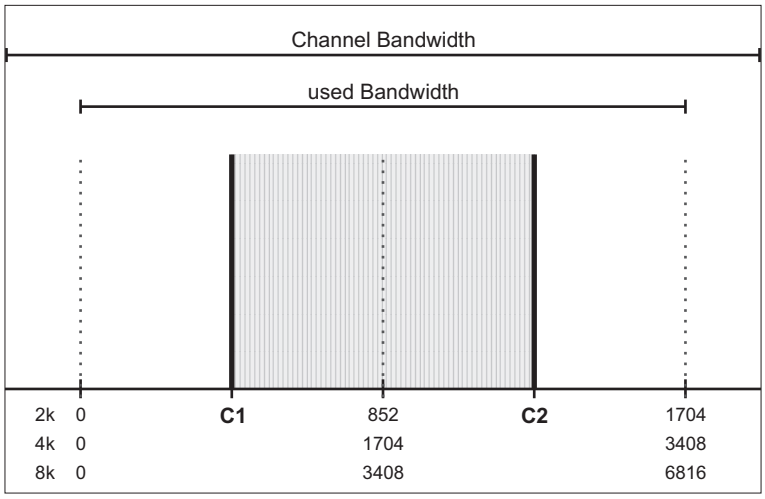


Fig. 16 *Test Signal Insertion function | Bandpass*

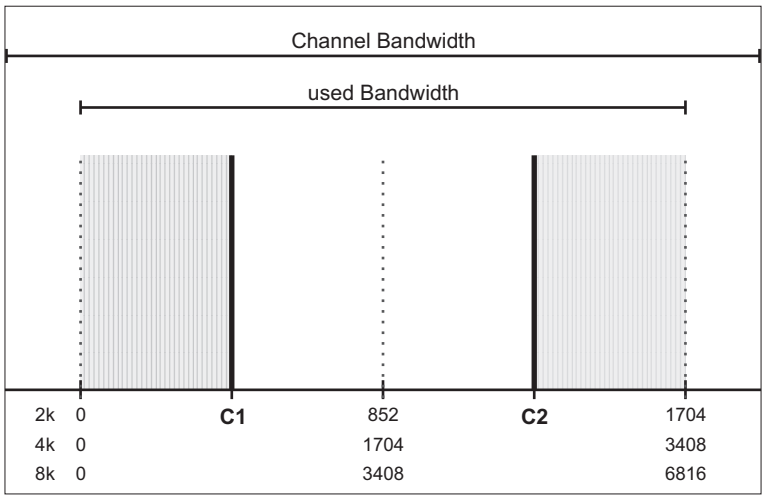


Fig. 17 *Test Signal Insertion function | Bandstop*

8 ATSC Settings: TV Settings > ATSC Menu

The menu windows in the **TV Settings** > **ATSC** menu can be used to configure up to two input channels.

Menu windows

The **TV Settings** > **ATSC** menu branches to the following menu windows:

- **Common**: Status display for amplifier control
- **Input Config**: Used to configure the input data streams; displays the data format, packet length and data rate
- **Input Automatic**: Used to preselect the operating input, configure the automatic input switchover and set the behavior in the event of failure of the input signal

8.1 TV Settings > ATSC > Common

Display	Explanation
Amplifier Control	Status display for amplifier control

8.2 TV Settings > ATSC > Input Config

Setting item	Explanation
Preselect Mode [HP1/HP2]	Used to set the data format for the two data streams (operating and standby signals) on inputs TS 1 IN or TS 2 IN. The options are as follows: – AUTO: Data format is detected automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream

Display	Explanation
Packet Length [HP1/HP2]	Displays the packet length detected at the respective input
Measured Data Rate [HP1/HP2]	Displays the *data rate measured* at the respective input without null packets
Required Data Rate [HP1/HP2]	Display for checking the measured data rate. The *maximum data processing rate* is displayed.
Active Mode [HP1/HP2]	Displays the data format detected or set at the respective input: – ASI: as described – SMTPE: as described – Auto: Auto is selected and no data stream is present

8.2.1 Checking Measured Data Rate

By comparing the **Meas. Data Rate [bps]** and **Req. Data Rate [bps]**, it is possible to check that the input buffers (FIFOs) are neither overflowing nor underflowing (both cases would result in transmission interruptions).

Maximum data processing rate

First, all null packets are removed from the transport stream. The associated useful data rate is measured and displayed under **Measured Data Rate**. Trouble-free operation is possible provided that this measurement value remains below the value for **Required Data Rate**.

Note *After the useful data rate has been measured, stuffing to the required data rate is performed, i.e. the difference between **Required Data Rate** and **Measured Data Rate** is compensated by inserting null packets.*

8.3 TV Settings > ATSC > Input Automatic

Setting item	Explanation
Preselect Input	Used to preselect the active input – INPUT 1: Operating input is **TS 1**. – INPUT 2: Operating input is **TS 2**.
Autoswitch	Used to switch *automatic input switchover* on or off In the event of a failure at the (active) operating input, automatic switchover to the standby input takes place. The automatic switchover mode is defined by the following parameter settings.
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Normally, it is not possible to switch back to a failed operating input following a switchover. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place, the system switches back to the preselected operating input as soon as the signal reappears.
Check Time Forward	Used to set a delay time (0 to 60 s) which must elapse before the standby input becomes active following failure of the operating input.
Check Time Back	Used to set a delay time (0 to 60 s) which must elapse before the (now active) standby input is switched back over to the preselected operating input. *The function has no effect if the priority mode is set to EQUAL.*
On Loss Of Input	Used to set the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed – Mute: Suppression of the output signal when the data rate is incorrect
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed.
Fail Delay Time	Used to set a delay time which must elapse following an input signal failure before a sum fault is generated.

8.3.1 Automatic Input Switchover

The transmitter has an automatic switchover function which, in the event of a signal failure, switches the transmitter from one input to the other input (provided that a valid input signal is available at the standby input). Before a failure occurs, the preselected input is active.

The way in which this automatic switchover function operates is determined by the following factors:

- Automatic switchover: ON or OFF (**Autoswitch**)
- Delay times which must elapse before the switchover is performed (**Check Time Forward** and **Check Time Back**)
- Priority mode: Inputs have the same priority or the preselected inputs have priority (**Priority**)
- Operating and standby inputs synchronized or not synchronized (in conjunction with **Seamless Switching**)

Automatic input switchover ON/OFF

If automatic switchover is OFF, the preselected input remains active even if the input signal fails.

If automatic switchover is ON and there is a failure at the preselected input, switchover to the associated standby input takes place.

Priority mode PRIO (input priority)

Following a switchover of the preselected input, the automatic system switches back to this priority input as soon as a signal reappears. Switchover is delayed for the set delay times.

If the signal fails at both the operating input and the standby input, the priority input remains active.

Priority mode EQUAL (equal input priority)

Following a switchover of the preselected input, the standby input with the same priority remains active until the input signal fails on this input also. The automatic system switches back to the preselected input, but only if a signal is present on it once again. Switchover is delayed for the set delay times.

Note *Selecting this operating mode keeps to a minimum the number of switchover operations and in certain cases the number of breaks in transmission (in the case of unsynchronized input streams).*

8.3.2 Behavior with Defective Input Signal

The behavior in the event of a defective input signal can be influenced using the **On Loss Of Input** switch:

– **Mute**: The output signal of the transmitter is suppressed as soon as synchronization with the input signal (from the operating input *and* standby input) is no longer possible.
– **No Mute**: The output signal of the transmitter is not suppressed even though the input signal is defective. However, when this happens only null packets are transmitted.

9 ATV Settings: TV Settings > ATV Menu

The menu windows in the **TV Settings** > **ATV** menu are used to enter settings for the ADTV coder with analog TV.

Menu windows/menu paths

The **TV Settings** > **ATV** menu branches to the following menu windows and menu paths:

– **Common**: Used to enter basic settings for signal processing
– **Vision** menu path: Used to set parameters for video signal processing in the ADTV coder
– **Sound** menu path: Used to set parameters for audio signal processing in the ADTV coder

9.1 TV Settings > ATV > Common

Setting item	Explanation
TV Standard	Used to select the ATV standard
IRT-NICAM	Setting: IRT or NICAM (for standards B|G, D|K, I, I1) – IRT: Second sound subcarrier is frequency-modulated – NICAM: Second sound subcarrier is modulated according to the NICAM specification
NICAM Mode	Used to select the NICAM mode (for standards B|G, D|K, I, I1): – Coder: AF signal feed of AF1 and AF2 via the inputs AUDIO 1 and AUDIO 2 as well as coding and modulation in the transmitter – Modulator: Signal feed as NICAM 728 data stream via the digital input NICAM DATA
NICAM Rolloff	Used to set the NICAM rolloff (for standards B|G, D|K, I, I1): – Auto: NICAM rolloff is automatically set according to the selected TV standard and in compliance with the NICAM specifications (*recommended setting !*) – 40% / 100%: Manual setting of the NICAM rolloff
Sound Select	Used to select the number of sound subcarriers (for standards B|G, D|K, I, I1, M1): – Single Carrier: One sound subcarrier – Dual Carrier: Two sound subcarriers

Setting item	Explanation
FM Input	Setting: AF 1 or BTSC (for standards M, N) – AF 1: MONO audio mode, signal feed via input AUDIO 1 – BTSC: BTSC audio mode, signal feed via input BTSC

9.2 TV Settings > ATV > Vision Menu

The menu windows in the **TV Settings** > **ATV** > **Vision** menu are used to set the parameters for video signal processing.

Menu windows

The **TV Settings** > **ATV** > **Vision** menu branches to the following menu windows:

– **White Control**: Used to switch on and adjust white control
– **White Limiter**: Used to switch on and adjust the white limiter
– **Sync Pulse**: Used to switch on and adjust sync-pulse regeneration
– **Equalizer**: Used to switch individual equalizer paths on or off

9.2.1 TV Settings > ATV > Vision > White Control

Setting item	Description
Automatic	Switches *white control* on or off.
Testline	Selects the test line for the white pulse. The test line can be in the first or second field.
Gain Source	Selection of the source for fixed video gain in case of*failure of the white pulse* with white control simultaneously switched on. The options are as follows: – MANUAL: For the gain, the manual settings under Manual Gain apply. – MEMORY: The gain uses the most recently saved value for white control.
Manual Gain	Manual setting of the video gain The value which is set is the gain of the actuator as a percentage referred to gain 1.

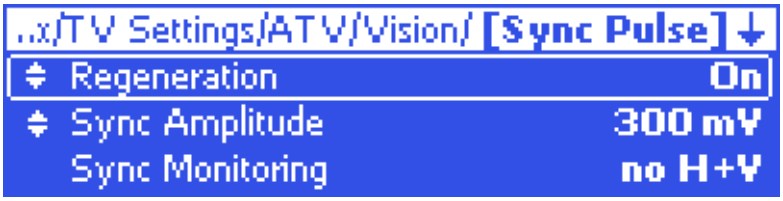
Display	Description
Memory Gain	Display of the last value saved by the *white control* which can be used for fixed video gain. The value which is displayed is the gain of the actuator as a percentage referred to gain 1.
Current Gain Source	Display of the active source for the video gain: – Manual: Manual setting (see Gain Source) – Memory: Memory for the white control (see Gain Source) – Automatic: White control
White Amplitude Input	Measured value for the white amplitude input
White Amplitude Output	Measured value for the white amplitude output
White Pulse Monitoring	Status display for the white pulse monitoring: – NONE: The test line with the white pulse was not found – OK: White pulse found and level OK – < -40% / < -30% / > +30% / > +40%: The level of the white pulse deviates from the nominal value by the displayed value.

9.2.2 TV Settings > ATV > Vision > White Limiter

Setting item	Description
Limiter	Switches the *white limiter* on or off.
Threshold	Sets the threshold for the *white limiter*.

Display	Description
Limiter Active	Status display for indicating if the white limiter responds.

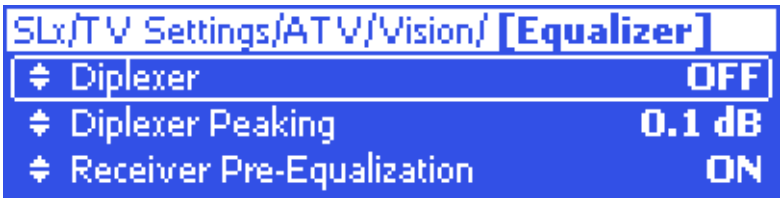
9.2.3 TV Settings > ATV > Vision > Sync Pulse



Setting item	Explanation
Regeneration	Used to switch *sync-pulse regeneration* on or off
Sync Amplitude	Used to set the amplitude of the regenerated sync pulse (with regeneration switched on)

Display	Explanation
Sync Monitoring	Indicates the status of sync-pulse monitoring of the input signal. The following may be displayed: – OK: A standard input signal is being applied – no V: No V-pulse frame detected – no H+V: No V and H-pulse frame detected – too low: Sync-pulse amplitude is less than 50% of the nominal sync-pulse amplitude; the processed signal is, however, available at the encoder output
Sync Amplitude Input	Displays the measured input amplitude [mV] of the sync pulse. If the selected scanning line is not found in the input signal, the measurement value 0 mV is displayed.
Sync Amplitude Output	Displays the measured output amplitude in [mV] of the sync pulse

9.2.4 TV Settings > ATV > Vision > Equalizer



Setting item	Explanation
Diplexer	Used to switch the *diplexer pre-equalization* (diplexer peaking) on or off

Setting item	Explanation
Diplexer Peaking	Used to set the peaking in the range 0.1 dB to 2.5 dB at the band limit of the upper sideband
Receiver Pre-Equalization	Used to switch the *receiver pre-equalization* on or off

9.3 TV Settings > ATV > Sound Menu

The menu windows of the **Sound** menu are used to set the parameters for audio signal processing.

Menu windows

The **Sound** menu branches to the following menu windows:

- **FM Audio Mode**: Used to select the audio mode and adjust the pilot tone
- **FM Carrier**: Used to select the operating mode for the FM sound subcarrier, and to set the deviation and deviation limiter for the FM sound subcarrier
- **FM Precorrection**: Used to switch on and adjust the sound phase shifter
- **NICAM Audio Mode**: Used to select the NICAM audio mode
- **NICAM Carrier**: Used to select the operating mode for the NICAM sound subcarrier and to switch the precorrection for the NICAM sound subcarrier on or off

9.3.1 TV Settings > ATV > Sound > FM Audio Mode

Setting item	Description
Coder Mode	Setting of the *audio mode*. The following settings are possible: Off, Mono, Stereo, Dual and Auto (Dataline). The selected TV standard determines the assignment of the audio inputs to the FM sound subcarriers. The following settings have a special meaning: – Off: Dual sound is set as the audio mode – Auto (Dataline): The audio mode is read from the*audio data line* in the picture signal.

Setting item	Description
Dataline	Selects the *audio data line* present in the picture signal; this is necessary for the Coder Mode > Auto setting.
Pilot	Switches the *pilot signal* on or off; not active in conjunction with NICAM.
Pilot Gain	Sets the level for the *pilot signal*; not active in conjunction with NICAM.

Display	Description
Dataline Info	Display of the indication of the *audio mode* present in the audio data line (N/A means there is no indication in the selected audio data line).
Current Audio Mode	Display of the *audio mode* that is currently set.
Current Pilot Deviation	Display of the FM deviation for the *pilot signal*.

9.3.1.1 Audio Mode

The audio inputs are assigned to the sound subcarriers according to the selected TV standard. This assignment is then displayed under **Carrier 1** and **Carrier 2** in the **Status** > **TV ATV** menu window.

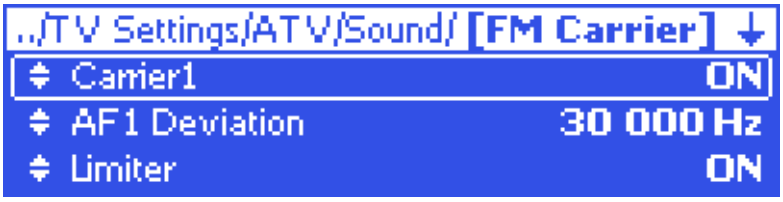
9.3.1.2 Audio Data Line

If "audio data line" is preselected as the source for determining the audio mode and it cannot be found in the picture signal, the manual settings will apply.

9.3.1.3 Pilot Signal

In order to indicate the audio mode, a pilot signal is added to the AF2 signal which modulates sound subcarrier 2.

9.3.2 TV Settings > ATV > Sound > FM Carrier



Setting item	Explanation
Carrier 1/Carrier 2	Used to set the mode for FM sound subcarrier 1 or 2; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
Nom. Deviation [Carrier 1/Carrier 2]	Used to set the nominal *FM deviation* for sound subcarrier 1 and 2
Deviation Limiter	Used to switch the deviation limiter for the FM sound subcarrier on or off
Limiter Threshold	Used to set a threshold at which the deviation limiter is triggered
Warning Above	Used to set a threshold at which the deviation limiter warning is activated *In most cases, it is recommendable for Limiter Threshold and Warning Above to have the same value.*

Display	Explanation
Current Deviation [Carrier 1/Carrier 2]	Indicates the current FM deviation for sound subcarrier 1 and 2
Limitation [Carrier 1/Carrier 2]	Status display which indicates whether the deviation limiter has triggered

9.3.2.1 FM Deviation

Nominal deviation

The nominal deviation determines the FM deviation which arises with the preemphasis switched off if a sinusoidal signal with the frequency of 500 Hz and a level corresponding to the nominal input level (see the "Input level" section) is fed into the AF input.

Suggestions for setting the FM deviation

You can modify the FM deviation by varying the input level (with an unchanged setting for the nominal input level) or by varying the setting for the nominal deviation.

The deviation should never be increased by increasing the input level since this will decrease the drive reserve (see "Permissible input level"), producing a risk of clipping the signal.

Instead, the nominal input level should be set equal to the current input level and the deviation should be increased by increasing the setting for the nominal deviation.

9.3.3 TV Settings > ATV > Sound > FM Precorrection

This window is used to precorrect the phase of the sound subcarrier for combined operation. Precorrection is performed separately for each of the two FM sound subcarriers (Carrier 1 and Carrier 2). Two setting items are defined for each of the two FM sound subcarriers.

Setting item	Description
Precorrection	Switches the *sound phase shifter* on or off.
Inset Point 1	Determines the position of the 1st inset point referred to the drive of the picture signal.
Slope 1	Determines the sharpness at the 1st inset point.
Inset Point 2	Determines the position of the 2nd inset point referred to the drive of the picture signal.
Slope 2	Determines the sharpness at the 2nd inset point.

9.3.3.1 Sound Phase Shifter

This sound phase shifter modifies the phase of the sound subcarrier as a function of the low-frequency drive of the picture signal in order to precorrect the phase of the sound subcarrier during combined operation.

When the sound phase shifter is switched on, its characteristic curve is determined using two inset points.

The reference for setting the position is initially a value of 37.5% for the rear black shoulder. Smaller values are in the range of the sync pulse. A value of 0% corresponds to a sync pulse amplitude of 500 mV. Larger values are in the picture range. A value of 90% corresponds to picture amplitude of 700 mV.

There is an additional condition that the setting for inset point 1 must always be greater than that of inset point 2. The sharpness of the two inset points is determined by the slope of the characteristic curve at these points. The magnitude of the setting determines the magnitude of the phase shift. A setting of 50% specifies the maximum value. The sign of the setting value determines whether the phase is shifted in the positive or negative direction.

9.3.3.2 Computation of the Characteristic Curve

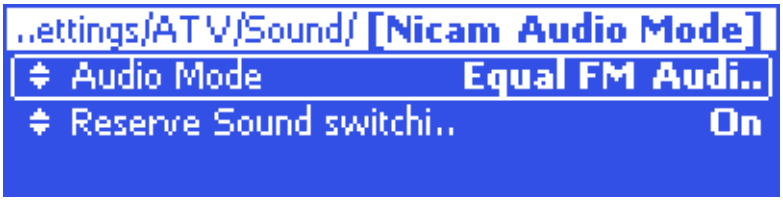
In computing the characteristic curve, it is divided using the two inset points into three linear ranges.

If the picture signal is driven in the range between the two inset points, no phase shift occurs, i.e. a correction phase of 0° is set.

If the picture signal is driven greater than the position of inset point 1, a correction phase not equal to 0° is set. The characteristic curve in this range begins with a correction phase of 0°, for a drive level corresponding to the position of inset point 1, and increases linearly up to the maximum phase set with inset sharpness 1 for drive of the picture signal of 100%.

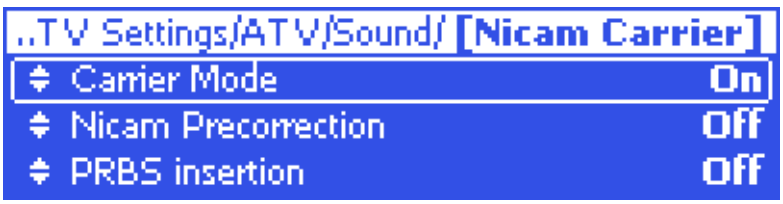
Analogously, for drive of the picture signal which is less than the position of inset point 2, a correction phase not equal to 0° is also set. The characteristic curve in this range begins with a correction phase of 0°, for a drive level corresponding to the position of inset point 2, and increases linearly up to the maximum phase set with inset sharpness 2 for drive of the picture signal of 0%.

9.3.4 TV Settings > ATV > Sound > NICAM Audio Mode



Setting item	Description
Audio Mode	Determines the NICAM audio mode (*possible only in the NICAM coder mode*): – Equal FM Audio Mode: The NICAM audio mode is oriented towards the FM audio mode. – Mono/Data, Stereo and Dual Sound: These settings determine the NICAM audio mode regardless of the FM channel; the encoding takes place in accordance with the NICAM specifications.
Reserve Sound Switching Flag	This flag can be set (On) or not set (Off); *possible only in the NICAM coder mode.*

9.3.5 TV Settings > ATV > Sound > NICAM Carrier



Setting item	Explanation
Carrier Mode	Used to set the mode for the NICAM sound subcarrier; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
NICAM Precorrection	Used to switch the precorrection for the NICAM sound subcarrier on or off; the actual precorrection takes place using the precorrector GUI.
PRBS insertion	Used to activate/deactivate PRBS for the NICAM carrier

10 Reference Sources: TV Settings > Reference Menu

The menu windows in the **TV Settings** > **Reference** menu are used to select reference sources for stabilizing frequency processing (reference frequency source) and 1 pps sources (e.g. optional internal GPS receiver).

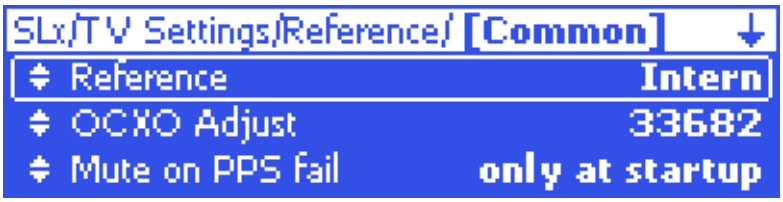
In addition, the behavior of the transmitter if the reference sources for frequency processing and the 1 pps fail can also be set.

Menu windows

The **TV Settings** > **Reference** menu branches to the following menu windows and menu paths:

– **Common**: Used to select the reference source and adjust the behavior on failure
– **GPS** menu path: Used to set the antenna type; GPS status displays

10.1 TV Settings > Reference > Common



Setting item	Explanation
Reference	Used to select the reference frequency source. The following settings are possible: – Internal: Operation without external reference frequency source – External 5 MHz: Operation with external 5 MHz reference applied – External 10 MHz: Operation with external 10 MHz reference applied – External 1pps: Operation with external time reference (1 pps) – Internal GPS: Operation with optional internal GPS receiver
OCXO Adjust	Used to adjust an internal OCXO frequency (for operating mode "Internal")

Setting item	Explanation
Mute on PPS Fail	Used to determine the behavior in SFN mode in the event of failure of the external time reference. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid 1 pps signal is detected; if the 1 pps signal fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the 1 pps signal fails for longer than the period specified under Fail Delay Time This is the recommended setting for operation in SFN mode.
Mute on Ref. Fail	Used to determine the behavior in SFN and MFN mode in the event of failure of the external reference frequency source. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid reference source is detected; if the reference source fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the reference source fails for longer than the period specified under Fail Delay Time This is the recommended setting for operation in SFN mode.
Fail Delay Time	If a reference source fails, the time specified here must elapse before the output signal is suppressed. The setting is effective if "after fail delay time" is set under Mute on PPS Fail or Mute on Ref. Fail. Selection: 0 to 24 hours; 0 hours = no delay time

10.1.1 Reference Frequency Source

The basis for frequency generation is a 10 MHz oven-controlled crystal oscillator (OCXO). This OCXO can be operated in various modes:

"Internal" mode

The OCXO runs in uncontrolled mode.

It obtains its control voltage via a D/A converter which can be set using the **OCXO adjust** setting item. This allows the OCXO frequency applied at the test output **REF OUT** (**X29**, rear panel of the transmitter) to be adjusted to 10 MHz where necessary.

"External 5 MHz" and "External 10 MHz" modes

The OCXO runs in controlled mode.

Due to the control, the control voltage generated by the D/A converter is adapted on an ongoing basis so that the 10 MHz frequency of the OCXO is synchronized with the externally supplied 5 MHz or 10 MHz reference frequency.

"External 1pps" mode

The OCXO runs in controlled mode.

The 10 MHz frequency of the OCXO is synchronized with the external seconds pulse. In this mode, for example, SFN operation is possible without separate feed of a 10 MHz reference.

"Internal GPS" mode

The OCXO runs in controlled mode.

The 10 MHz frequency of the OCXO is synchronized with an optional internal GPS receiver.

10.1.2 Holdover Mode (if reference frequency fails)

As soon as a failure of the external reference frequency is detected, the control voltage for the OCXO is no longer modified. The result of this is that the RF generation is now based on the stability of the OCXO.

As soon as the external reference frequency is restored, the control voltage on the OCXO will be controlled again with the externally supplied reference frequency.

10.2 TV Settings > Reference > GPS Submenu

The menu windows in the **TV Settings** > **Reference** > **GPS** menu contain information for operation of the internal optional GPS receiver as a frequency and time reference. There is also a setting to allow an active GPS antenna to be supplied with power from the transmitter.

The information on the accuracy of the position and time determination and the number and quality of the received satellites allows the suitability of the antenna location to be assessed. It is therefore used for planning and control purposes.

Menu windows

The **GPS** menu branches to the following menu windows:

– **Status**: Used to set the GPS antenna type; status displays for antenna and satellite reception as well as position and time information together with accuracy
– **Satellites**: Displays the quality and signal/noise ratio of the received satellites

10.2.1 TV Settings > Reference > GPS > Status

Setting item	Explanation
Antenna type	Used to set the GPS antenna type The following settings are possible: – active: The antenna is supplied with DC voltage (5 V) from the GPS module – passive: The antenna is not supplied with DC voltage from the GPS module *Longer cables can be used with active antennas ("active" setting).*

Display	Explanation
Satellites used	Number of satellites currently being used for position and time determination
Satellites in view	Number of satellites currently being received
Antenna state	Status of GPS ANTENNA antenna input (X2) With active antennas, the following may be displayed: – OK: The active antenna is correctly connected – OPEN: No active antenna is connected – SHORT: A short-circuit has been detected at the antenna input – UNKNOWN: The antenna status cannot be determined (standard display when "Antenna type" is set to "passive") *The status display is not available for passive antennas.*
Position valid	– OK: The position (latitude and longitude) can be determined – not valid: The position cannot be determined
UTC	Received coordinated universal time (UTC) Display e.g. 12:34:56.00
TDOP	Parameter which describes the accuracy of the time determined by GPS
PDOP	Parameter which describes the accuracy of the position determined by GPS
Latitude	Latitude in WGS84 *The display can be deactivated at the factory on request.*

Display	Explanation
Longitude	Longitude in WGS84 *The display can be deactivated at the factory on request.*
Time Mode	Status display for the current *time mode* The following may be displayed: – *Survey-in*: The receiver calculates its own precise position and accumulates position data to optimize accuracy. After a power failure, it takes a relatively long time before the receiver has synchronized with the satellites and can deliver a stable reference. – *Fixed Mode*: The receiver has stored a precise position. After a power failure, the receiver can deliver a stable reference again after a relatively short time.
Minimum Duration	Predefined time that the survey-in mode requires before the receiver can change to the fixed mode
Variance Limit	Predefined accuracy limit which must be underranged before the receiver can change from the survey-in mode to the fixed mode If both conditions for Minimum Duration and Variance Limit are fulfilled, the survey-in mode changes to the fixed mode.

10.2.2 TV Settings > Reference > GPS > Satellites

The **Satellites** menu window lists the received satellites (ID) with reception quality and signal/noise ratio. The list is sorted by C/N value (best value at top). The number of lines displayed varies according to the number of visible satellites.

Display	Explanation
ID	ID for a received satellite
Quality [ID]	Reception quality for the satellite concerned together with the following classification: – 0: Satellite not visible – 1, 2 : Receiver searching for satellite signal – 3: Receiver has detected a satellite signal, but signal is unusable – 4: Receiver has switched to the C/A code – 5, 6: Receiver has switched to the C/A code and carrier L1 – 7: Receiver can read out satellite data with 50 bps
C/N [ID]	Signal/noise ratio referenced to carrier

11 Basic Settings: System Setup Menu

The menu windows in the **System Setup** menu are used to make basic settings for transmission operation, signal processing and operating the transmitter.

In addition, available software options can also be activated and the electronic type plates of the device can be read out for servicing purposes.

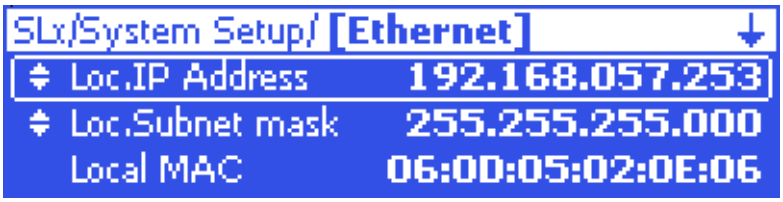
Menu windows/menu paths

The **System Setup** menu branches to the following menu windows and menu paths:

- **Ethernet**: Used to configure the Ethernet interfaces of the transmitter
- **SNMP** menu path: Used to configure the SNMP connection
- **Date | Time**: Used to enter the current date and time
- **Options** menu path: Used to activate/deactivate software options; displays the status of software options
- **Transmitter**: Used to set the TV standard ATV, DVB or ATSC
- **Device Info** menu path: Displays electronic type plates

11.1 System Setup > Ethernet

The **System Setup** > **Ethernet** menu window is used to configure the two Ethernet interfaces for operation by PC or network client.



Setting item/display	Explanation
Local Ethernet	The X30 interface (ETHERNET LOCAL) of the transmitter is used to connect the PC or laptop for local operation via a web browser.
IP Address	IP address of the Ethernet interface X30. To allow communication with a connected PC, the address must be in the subnet of the network interface of the PC.
Subnet Mask	Displays the subnet mask of the Ethernet interface X30. To allow communication with a connected PC, the subnet mask must correspond to that of the PC.
MAC	Displays the unique hardware address of the Ethernet interface X30

Setting item/display	Explanation
Remote Ethernet	The X31 interface (ETHERNET REMOTE) of the transmitter is used for connection to a customer-specific remote monitoring system (remote operation).
IP Address	IP address of the Ethernet interface X31. To allow communication with a remote network client, the address must be in the subnet of the remote monitoring system.
Subnet Mask	Subnet mask of the Ethernet interface X31. To allow communication with a remote network client, the subnet mask must correspond to that of the remote monitoring network.
MAC	Displays the unique hardware address of the Ethernet interface X31
Gateway	Used to enter the gateway address (predefined by the network administrator)

11.1.1 Preset IP Addresses

The Ethernet interfaces of the R&S SLx8000 are factory-configured as follows:

	IP address	Subnet mask
ETHERNET LOCAL (X30)	192.168.057.253	255.255.255.0
ETHERNET REMOTE (X31)	192.168.059.241	255.255.255.0

11.2 System Setup > SNMP Submenu

The operating software of the transmitter has an agent. This agent can communicate with a remote management station that is used for monitoring and remote control via SNMP protocol. The agent is configured in the menu windows of the **System Setup** > **SNMP** menu.

Menu windows

The **SNMP** menu branches to the following menu windows:

- **General**: Used to set the UDP port for SET/GET and to activate message suppression for local operation mode
- **Manager**: Used to set access protection for communities
- **Alarmsinks**: Used to configure alarm sinks

Note *To be able to use the SNMP functionality of the transmitter, the appropriate software option must be activated.*

11.2.1 SNMP > General Menu Window

Function	Explanation
Port SET/GET	UDP port for SNMP SET/GET Default setting: 161
Inhibit Status	Switch for message suppression in Local mode – Off: Traps (alarm messages) are sent in both operating modes (Remote and Local) – On: No traps are sent in Local mode but the alarms are stored; exception: trap for Local Mode Default setting: Off If OIDs are polled with message suppression active, the return value is 0 (undefined). In this operating state, SNMP commands (SET) are not executed but simply confirmed. When the Remote mode is reactivated, all stored alarms are sent once. The polling of OIDs again returns current values.
Max. not transmitted	Number of alarms to be stored if message suppression is active Default setting: 255

11.2.2 SNMP > Manager Menu Window

Function	Explanation
Access Level [1 … 5]	Used to select access authorization for one of five user groups – Read Only: For GET (only read access to the agent) – Read / Write: For SET (read and write access to the agent)

Function	Explanation
Community [1 … 5]	Used to set the SNMP community string (a type of password) for a user group Default setting: "public" for read only (GET) and "broadcast" for read / write (SET) *Case-sensitive!*
Enable	Used to activate (On) or deactivate (Off) a community *The Off setting is used for configuration purposes and for testing.*

11.2.3 SNMP > Alarmsinks Menu Window

Function	Explanation
Alarmsink	Used to select one of 5 alarm sinks for configuration
Enable	Used to activate (On) or deactivate (Off) a selected alarm sink *The Off setting is used for configuration purposes and for testing.*
IP Address	IP address of the alarm sink to which alarms are to be sent
Port	UDP port for the SNMP alarms Default setting: 162
Alarm Version	SNMP version in which the alarm is to be sent (v1 Trap, v2c Trap or v2c Inform) Traps are sent once only; Informs, however, are repeated several times until confirmation of the alarm sink is received.
Community	Used to select the community (access protection) The community set here must also be used on the manager side. A distinction is made between upper-case and lower-case characters. *Communities are configured in the SNMP > Manager menu.*
Inform Retry	Number of repetitions of an Inform (with v2c Inform only) If after the final repetition of an Inform no confirmation of the alarm sink is received , this alarm is no longer sent.

Function	Explanation
Inform Timeout	Time which is to elapse before an inform is sent again (with v2c Inform only)
Inform Unack'd	Number of unconfirmed alarms which can be stored by the agent (with v2c Inform only)

11.3 System Setup > Date | Time

The date and precise time are required to make correct logbook entries. This information is supplied by the realtime clock of the R&S SLx8000. If necessary, the **System Setup** > **Date | Time** menu window can be used to correct the time and date information.

Setting item	Description
Date	Current date
Time	Local time

11.4 System Setup > Option Keys Menu

Certain features of the device are activated using the Option Keys mechanism.

Each available software option can be enabled by installing a valid *activation key*. If a software option is later no longer required, activation can be canceled again by installing a *deactivation key*.

Note *The deactivation mechanism allows software options which are no longer required to be "returned" to Rohde & Schwarz.*

Option keys are available from your local Rohde & Schwarz sales partners.

Installing option keys

Option keys can be installed in two ways:

– Automatic installation of one or more activation keys using the Software Distributor

  The procedure is the same as for performing software updates (see the chapter "Maintenance").

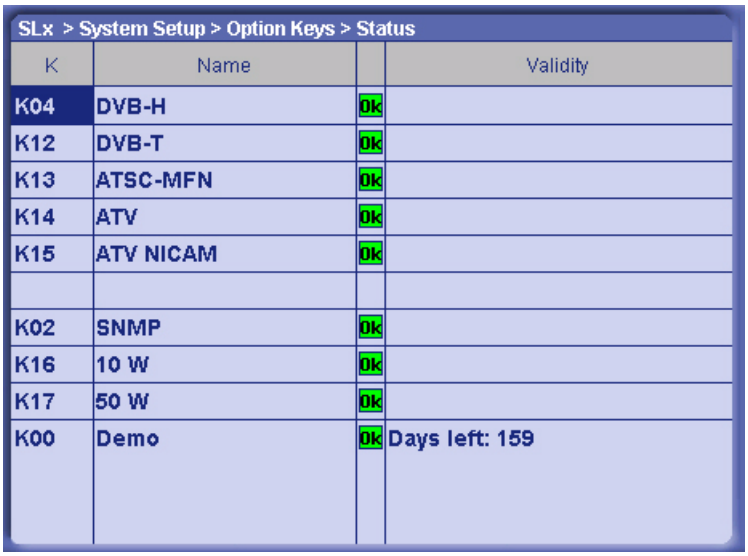
– Installation of an option key by means of a web browser

  With this method, the option key can be transferred from, for example, a received mail using the copy/paste function.

The second method uses the installation menu **TV Settings** > **System Setup** > **Option** > **Install** described below.

11.4.1 System Setup > Option Keys > Status

The **System Setup** > **Option Keys** > **Status** menu window lists the available software options with their respective activation status.



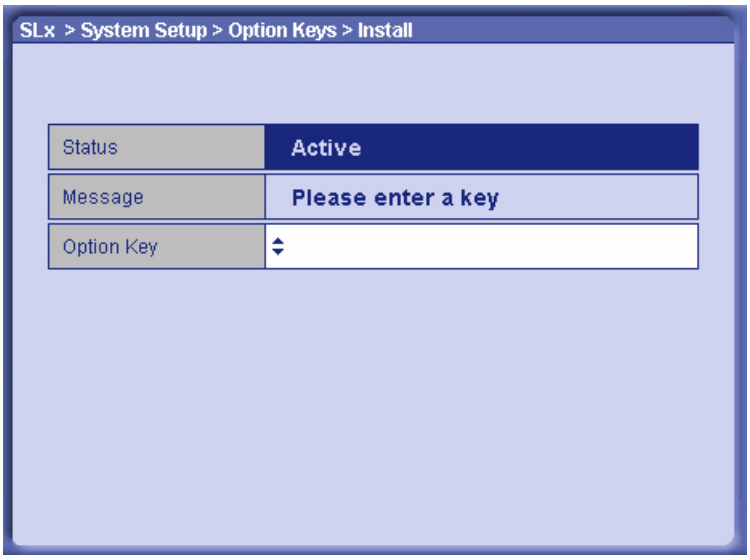
List column	Explanation
K	The K material number and stock number of the device are used to order an option key to activate a software option from Rohde & Schwarz sales partners.
Name	Name of the software option
—	Status of a software option: – Green (OK): Option has been activated – Gray: Option has not been activated

List column	Explanation
Validity	Validity period of an installed option key: – Permanent: Option activated for an unlimited period (standard license) – "Expiry date": Option remains activated until the displayed expiry date (e.g. as a test license) *If the activation mechanism is not supported by the hardware, all software options are activated automatically (status = OK). In this case, no validity period is displayed in the Validity column.*

Note *There must be (at least) one software option activated for the TV standard in order for the transmitter to generate an RF signal at the output.*

11.4.2 System Setup > Option Keys > Install

The **System Setup** > **Option Keys** > **Install** menu window is used to install option keys manually.

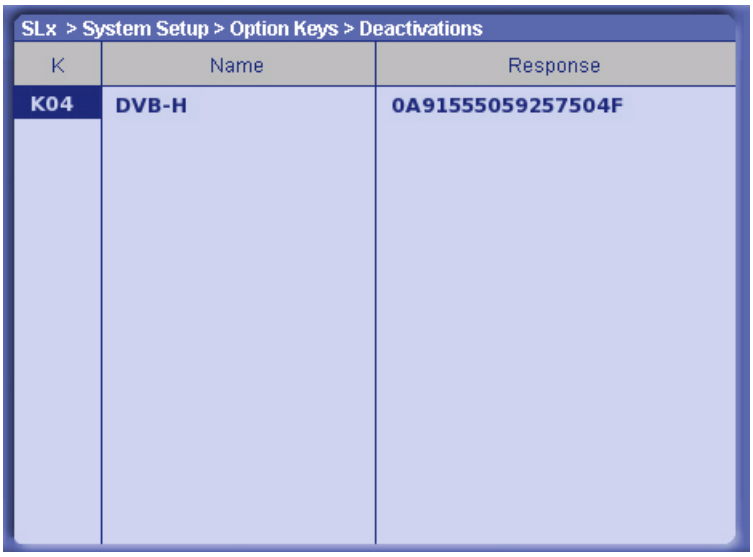


Setting item	Explanation
Option Key	Used to enter a 30-digit code to activate (or deactivate) a software option. Entry of the code is completed with **Enter** or **OK**.

Display	Explanation
Status	– Status = OK: The mechanism used to activate/deactivate software options is supported by the hardware. To be able to use a software option, the associated option key must be installed. – No key needed: The mechanism used to activate/deactivate software options is not supported by the hardware. All available software options can be used without installing option keys.
Message	Dialog box with the following messages: – Please enter a key: Prompt to enter a key – Key OK: Key entered successfully (the display changes back to "Please enter a key" after a few moments) – Key deactivated: Deactivation key entered successfully (the display changes back to "Please enter a key" after a few moments) – Invalid format: Invalid key entered

11.4.3 System Setup > Option Keys > Deactivations

The **System Setup** > **Option Keys** > **Deactivations** menu window lists software options which were once active, but have been deactivated again using a deactivation key.



Column	Explanation
K	The K material number and stock number of the device are used for ordering an option key to activate a software option from Rohde & Schwarz sales partners.
Name	Name of the software option

Column	Explanation
Response	Acknowledgment code as a system response to a deactivation To prove that a software option has been deactivated, the acknowledgment code must be sent to the Rohde & Schwarz sales partner (e.g. by e-mail).

11.5 System Setup > Transmitter

The **System Setup** > **Transmitter** menu window is used to set the input interfaces and signal processing in the transmitter to the respective TV standard.

Setting item	Explanation
Tx Type	Used to select the TV standard: ATV, DVB or ATSC The transmitter is rebooted automatically when the TV standard is changed. Signal processing is also switched over.

11.6 Menü System Setup > Device Info

The menu windows under **System Setup** > **Device Info** contain the electronic type plates for the transmitter as a whole as well as for the individual modules or elements in the transmitter:

- Device (complete device)
- Components (modules)
  - Coder
  - RF board
  - Amplifier
  - GPS

The structure of the individual type plates is more or less identical. The type plates for the complete device and the coder are shown in the examples.

11.6.1 System Setup > Device Info > Device

Display	Explanation
Part Number	Stock number
Variant	Device variant
Product Index	Product change index
Serial Number	Serial number
Product Date	Date of production
SW/FW/BIOS Number	Stock number of the software, firmware or BIOS
SW/FW/BIOS Version	Version number of the software, firmware or BIOS
Operating hours	Number of operating hours
Power up cycles	Number of times the device has been switched on/off

The information saved here is used for troubleshooting purposes. If servicing is required, this information allows you to precisely identify the device variant.

11.6.2 System Setup > Device Info > Boards > Coder/RF Board/ Amplifier/GPS Board

Display	Explanation
Part Number	Stock number
Variant	Module variant
Product Index	Product change index

Display	Explanation
Serial Number	Serial number
Product Date	Date of production
BIOS Version	Version number of the BIOS (coder only)
Operating hours	Number of operating hours
Power up cycles	Number of times the device has been switched on/off

The information saved here is used for troubleshooting purposes. If servicing is required, this information allows you to precisely identify the defective component and order a replacement.

12 Other Menu Paths (web browser only)

12.1 Storage Menu: Saving Transmitter Data

You can save the parameter data of the transmitter on an external medium and then recall this data when required.

Note *This function is described in the chapter "Maintenance".*

CHAPTER 6

MAINTENANCE

Printed in Germany

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1 Maintenance Information

1.1 Overview of Maintenance Work

The device has been designed to provide years of operation with little maintenance. Maintenance of the hardware is limited to:

- Software updates (as required)
  (for improved performance and for retrofitting options)
- Replacement of fan after approx. 40000 operating hours
- Replacement of fan mat (option)

Further actions:

- Backup of parameter data to an external medium (recommended)
- Adjustment of I/Q modulator (if required)

1.2 Required Tools

Software update	– PC – Update data (on CD-ROM) – RJ-45 cable (crossover or patch cable)
Backup of parameter data	– PC as backup medium
Replacement of fan	– Torx screwdriver TX10
Adjustment of I/Q modulator	– With manual adjustment: spectrum analyzer – With automatic adjustment: no tools necessary

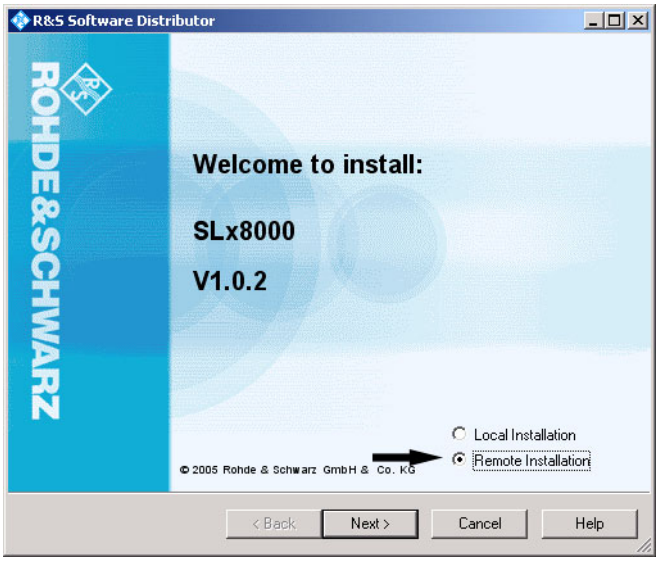
2 Software Update

To perform a software update, you must connect the transmitter to a PC or network client via the Ethernet and make sure that the interface (**X30**, **ETHERNET LOCAL** or **X31**, **ETHERNET REMOTE**) is correctly configured.

The procedure for performing a software update is as follows:

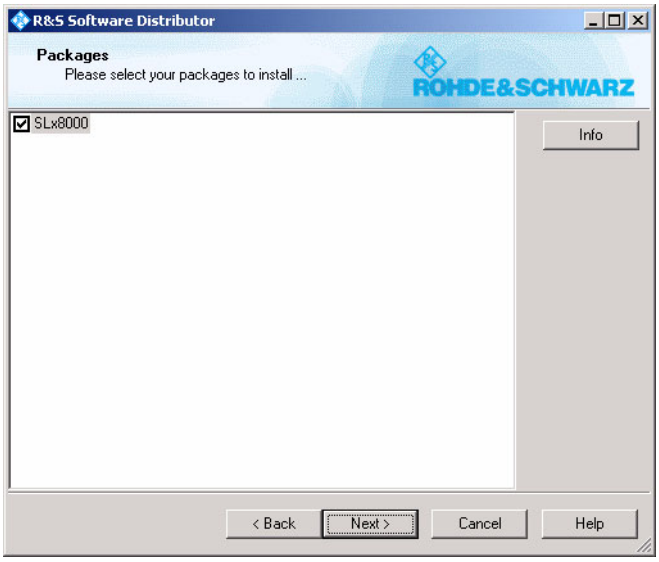
1. Deactivate the energy saving option of the network card in the PC. Proceed as follows:
   a) Under Windows, open the Device Manager by selecting **Start** > **Control Panel** > **System** > **Hardware** > **Device Manager**.
   b) In the Device Manager, select the correct network adapter and then double-click to open the associated Properties window.
   c) In the Properties window, click the **Power Management** tab and (if required) deactivate the option **Allow the computer to turn off this device to save power.**
2. Start the installation software on the PC/client.

   The start window of the R&S Software Distributor appears.



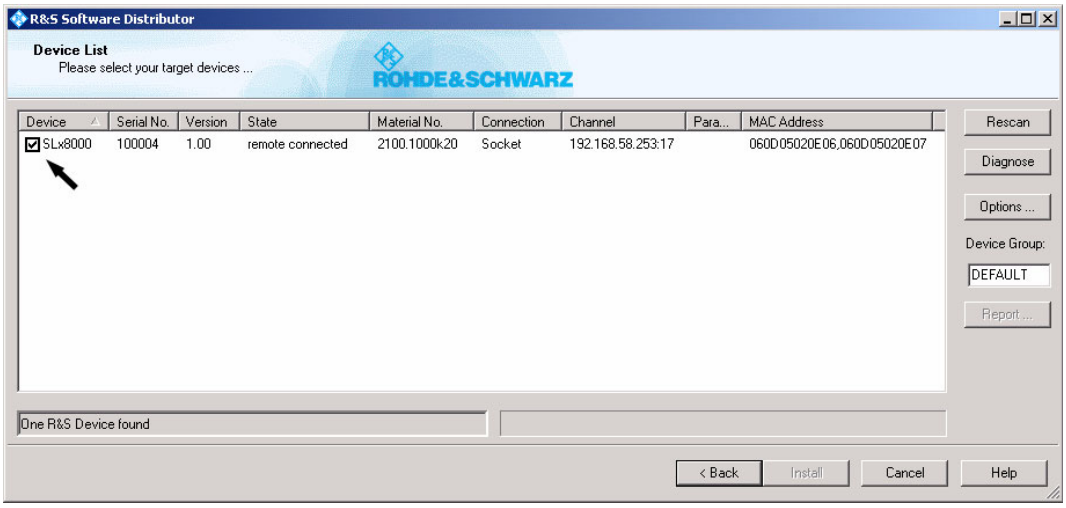
3. Select **Remote Installation** and confirm with **Next**.

   The software updates that can be installed are displayed. You can obtain additional information about the update you select by highlighting it with the cursor and then clicking the **Info** button.



4. In the network, search for updatable devices by clicking **Next**.

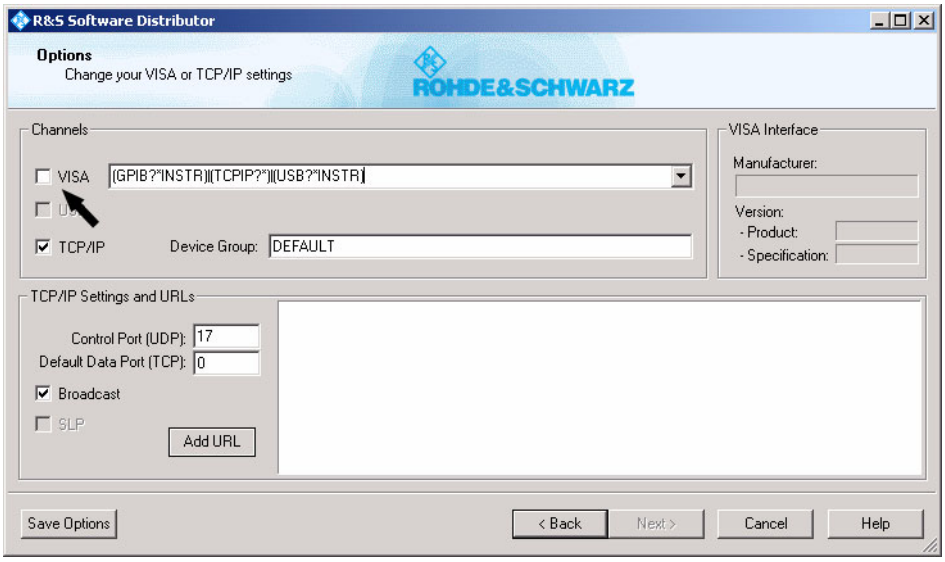
   The devices found will be listed after few seconds.



5. If despite correct network settings no devices are found, the VISA interface is probably active. If this is the case:

   a) Check the settings by clicking **Options** and, if necessary, deactivate **VISA** using the check box.

   b) Save the changed settings by clicking **Save Options** and then search for devices again by clicking **Rescan**.



6. In the **Device List**, select the device to be updated by enabling the check box.
7. Click **Install** to start the update.

   After the update has been completed, an appropriate message will appear in the field bottom left in the window. The transmitter is automatically rebooted.

Note *If the update is aborted before it has been completed (the message "Copying/Installing ... %" stops before 100% is reached), abort the update by clicking **Cancel** and then re-start the R&S Software Distributor.*

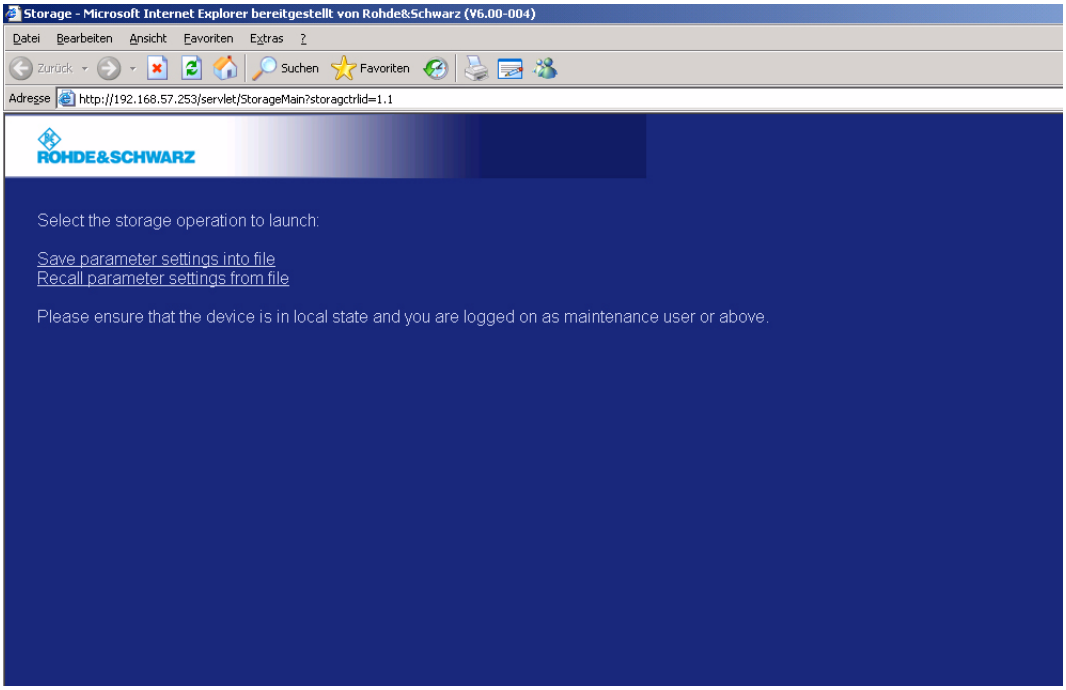
3 Backing Up Parameter Data

You can save the parameter data of the transmitter on an external medium and then recall this data when required.

To do so, you must first set up local operation via PC and web browser.

☞ Select **Storage** in the browser window.

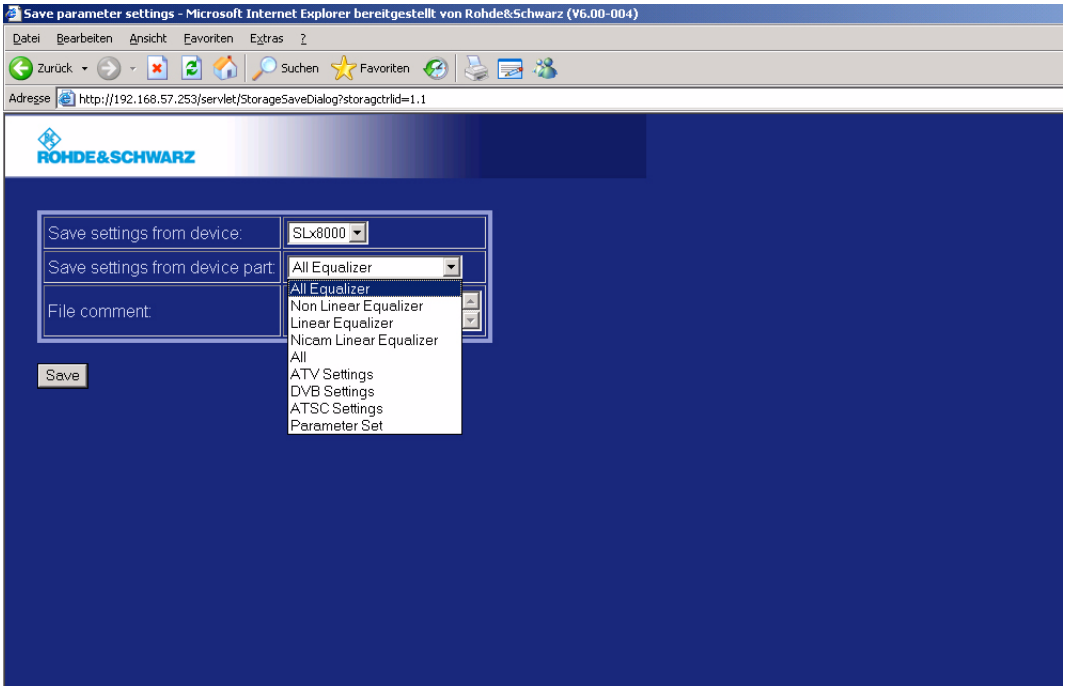
The start window to save and recall parameter data is displayed.


Storage - Microsoft Internet Explorer bereitgestellt von Rohde&Schwarz (V6.00-004)
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten
Adresse http://192.168.57.253/servlet/StorageMain?storagctrlid=1.1
ROHDE&SCHWARZ
Select the storage operation to launch:
Save parameter settings into file
Recall parameter settings from file
Please ensure that the device is in local state and you are logged on as maintenance user or above.

3.1 Saving Parameter Data on PC

1. In the start window, select **Save parameter settings into file**.

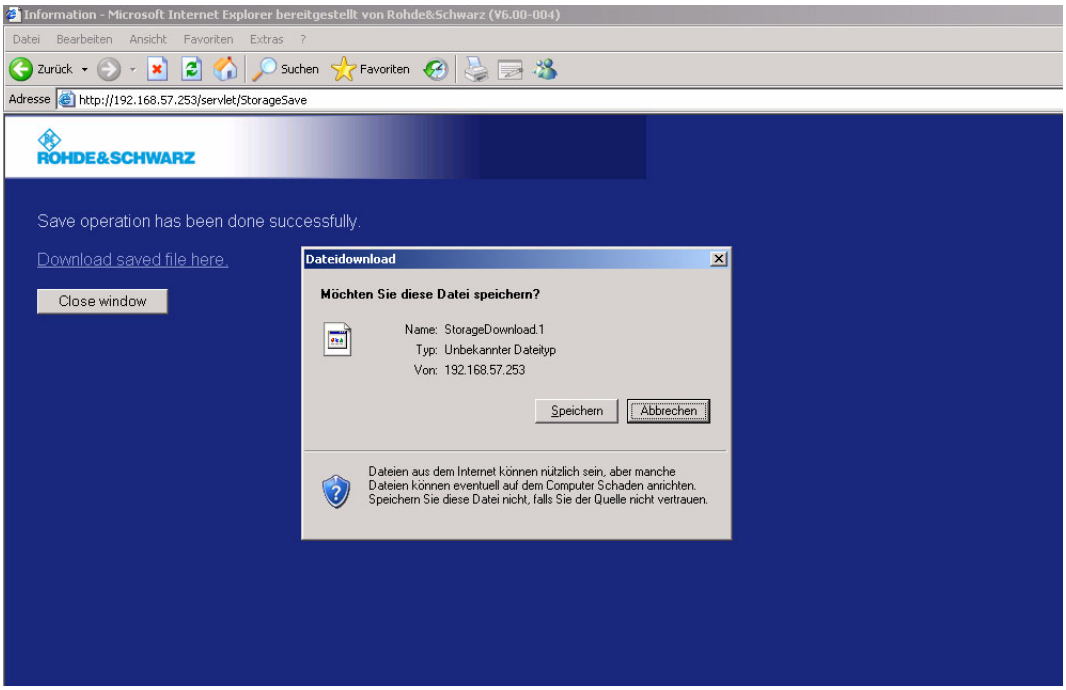
   A window opens from which you can select the parameter data you want to save.



2. Select the parameter data set you want to save.
3. Enter a unique comment for the selected parameter data set to help you recognize the content of the parameter data set or its intended use.
4. Click **Save**.

   The parameter data set is transferred to the PC.

5. Click **Download saved file here** and confirm the subsequent Windows dialog box to save the parameter data set to a file.

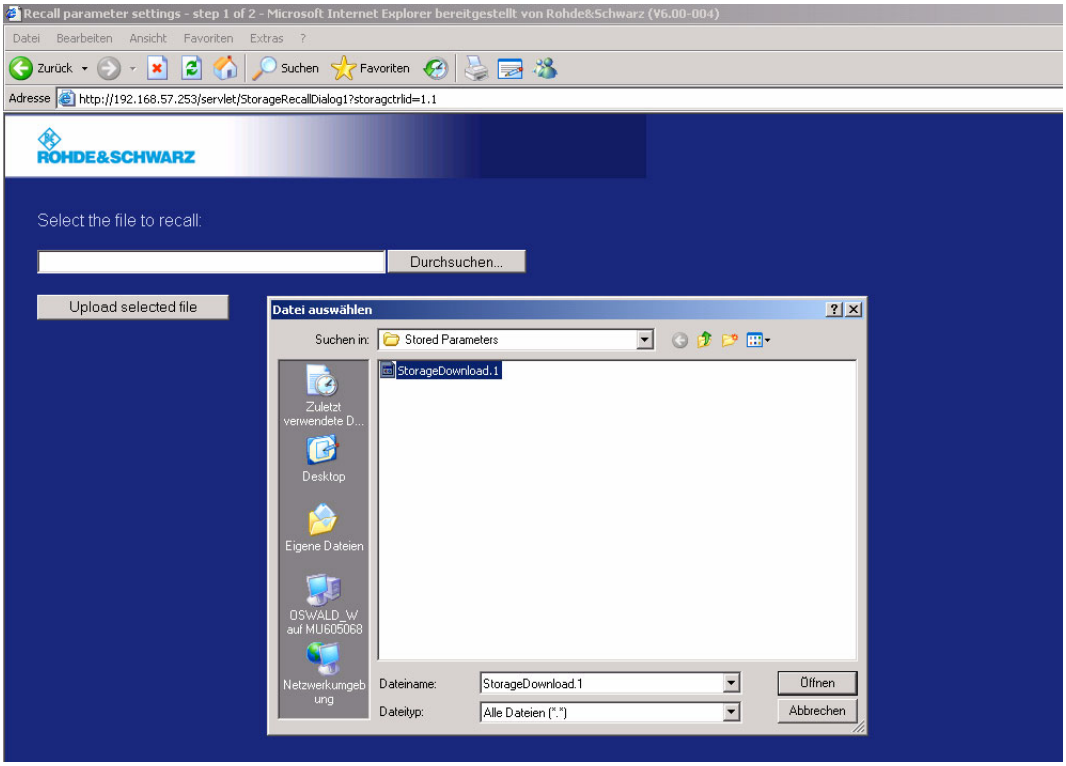

Information - Microsoft Internet Explorer bereitgestellt von Rohde&Schwarz (V6.00-004)
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten
Adresse http://192.168.57.253/servlet/StorageSave
ROHDE&SCHWARZ
Save operation has been done successfully.
Download saved file here.
Close window
Dateidownload
Möchten Sie diese Datei speichern?
Name: StorageDownload.1
Typ: Unbekannter Dateityp
Von: 192.168.57.253
Speichern
Abbrechen
Dateien aus dem Internet können nützlich sein, aber manche Dateien können eventuell auf dem Computer Schaden anrichten. Speichern Sie diese Datei nicht, falls Sie der Quelle nicht vertrauen.

3.2 Loading Parameter Data From PC

ATTENTION!
When you read in parameter data, the current parameters are overwritten without prior warning.

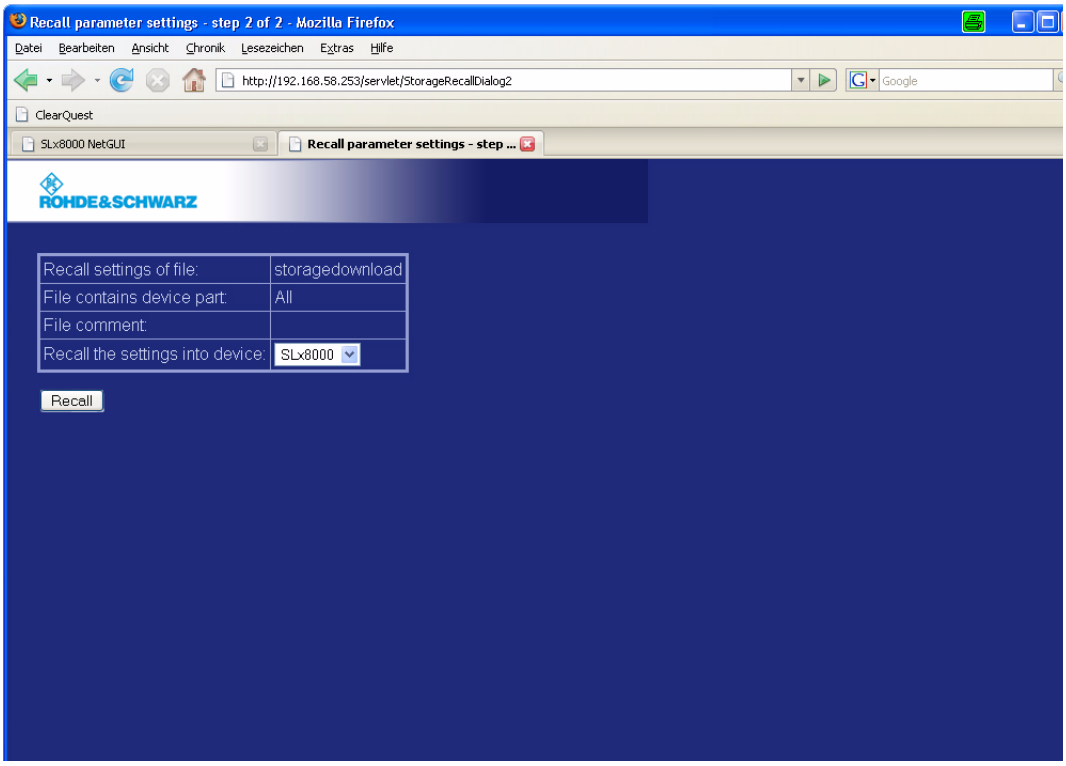
1. In the start window, select **Recall parameter settings into file**.

   A window appears in which you can select the saved parameter data you want to load.



2. Click **Browse** and select the required file.
3. Click **Upload selected file** to load the file.

   A confirmation window appears.


Recall parameter settings - step 2 of 2 - Mozilla Firefox
Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe
http://192.168.58.253/servlet/StorageRecallDialog2
ClearQuest
SLx8000 NetGUI
Recall parameter settings - step ...
ROHDE&SCHWARZ
Recall settings of file: storagedownload
File contains device part: All
File comment:
Recall the settings into device: SLx8000
Recall

4. Confirm the selected file with **Recall**.

   The parameter data is copied to the transmitter.

4 Adjusting I/Q Modulator

Note *The transmitter must have been in operation for at least 30 minutes before adjustment is performed (operating temperature).*

Objective

If quadrature modulation were optimal (theoretically possible), the residual carrier would be completely suppressed. In actual practice, however, residual carriers arise (e.g. due to crosstalk). They must be suppressed using suitable correction carriers.

The objective of I/Q adjustment is to suppress the undesired center carrier and undesired carrier in the sideband with respect to a test carrier by better than 60 dB.

Two methods are available

Two methods are available to perform the I/Q adjustment: setting and testing actuators manually or via a convenient automatic process.

The automatic method will usually meet the requirements. Yet, it may sometimes be useful to test the automatically determined values for the actuators and to improve them.

4.1 Automatic Adjustment

1. Call the **TV Settings** > **RF Out** > **IQ Adjust** menu.

2. Under **Auto I/Q Adjust**, select the setting **Start** and confirm with **OK**.

   The automatic process starts and the status display under **Auto I/Q Adjust** is changed to **In Progress**. In this state, transmitter parameters can no longer be changed. Moreover, the output signal is suppressed during the calculation.

   After approx. 5 minutes, the status will change (again) to **Adjusted**. Automatic I/Q adjustment is then completed and the determined actuators will be displayed under **Bias Course**, **Bias Fine**, **Gain** and **Phase**.

4.2 Manual Adjustment

Preparation and test carrier measurement

1. Call the **TV Settings** > **RF Out** > **IQ Adjust** menu.

2. Switch on the test signal using the **I/Q Testsignal** switch.
3. Connect a spectrum analyzer to the **RF MONITOR** output on the front panel of the transmitter and select the following settings:

Center Frequency	Frequency of the vision carrier
Span	6 MHz
Resolution BW	30 kHz
Video BW	300 Hz
Sweep	coupled

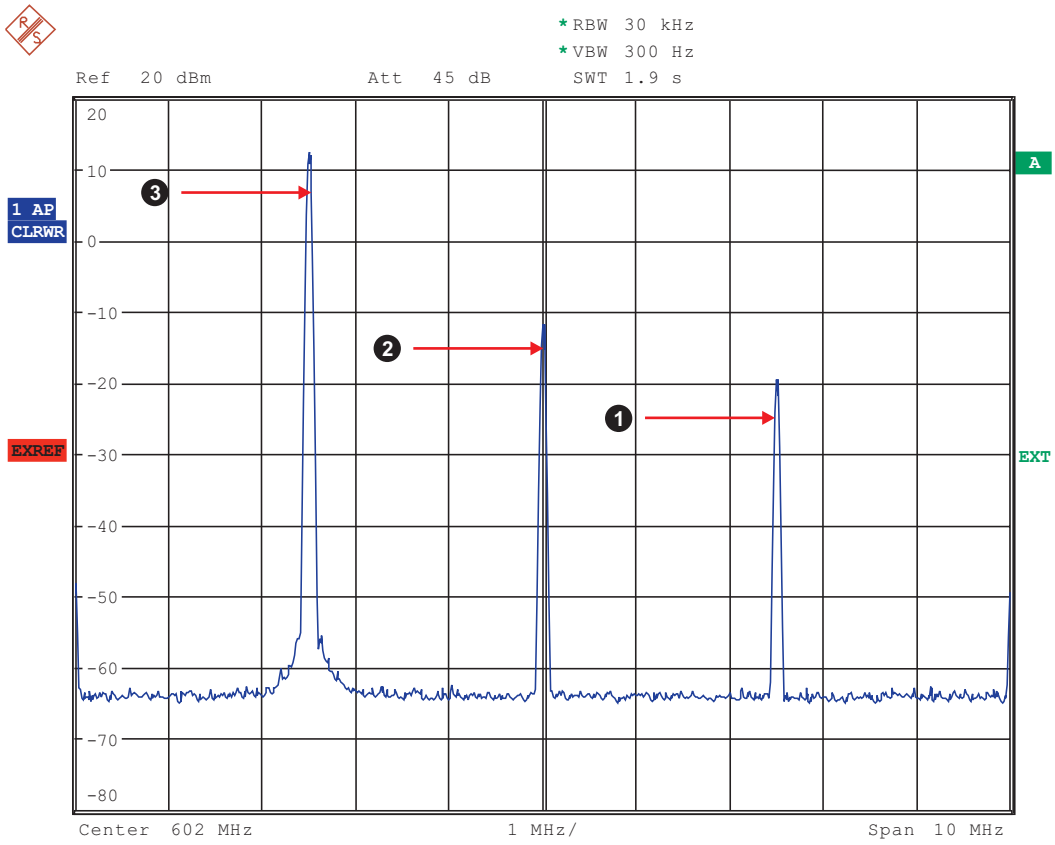


Fig. 1 *Spectrum analyzer display prior to adjustment*

1) *Unwanted carrier in sideband at vision carrier frequency +2.5 MHz*
2) *Unwanted center carrier at vision carrier frequency*
3) *Desired test carrier at vision carrier frequency -2.5 MHz*

Implementation

1. Set the **Bias Fine [I/Q]** actuators to zero.
2. *Course adjustment, center carrier*: Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
3. *Sideband adjustment*: Use the **Gain [I/Q]** and **Phase** actuators to suppress the undesired carrier in the sideband by more than 70 dB with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
4. *Course adjustment, center carrier optimization*: Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
5. *Fine adjustment, center carrier*: If the center carrier is suppressed by less than 70 dB, carry out a fine adjustment using the **Bias Fine [I/Q]** actuators.

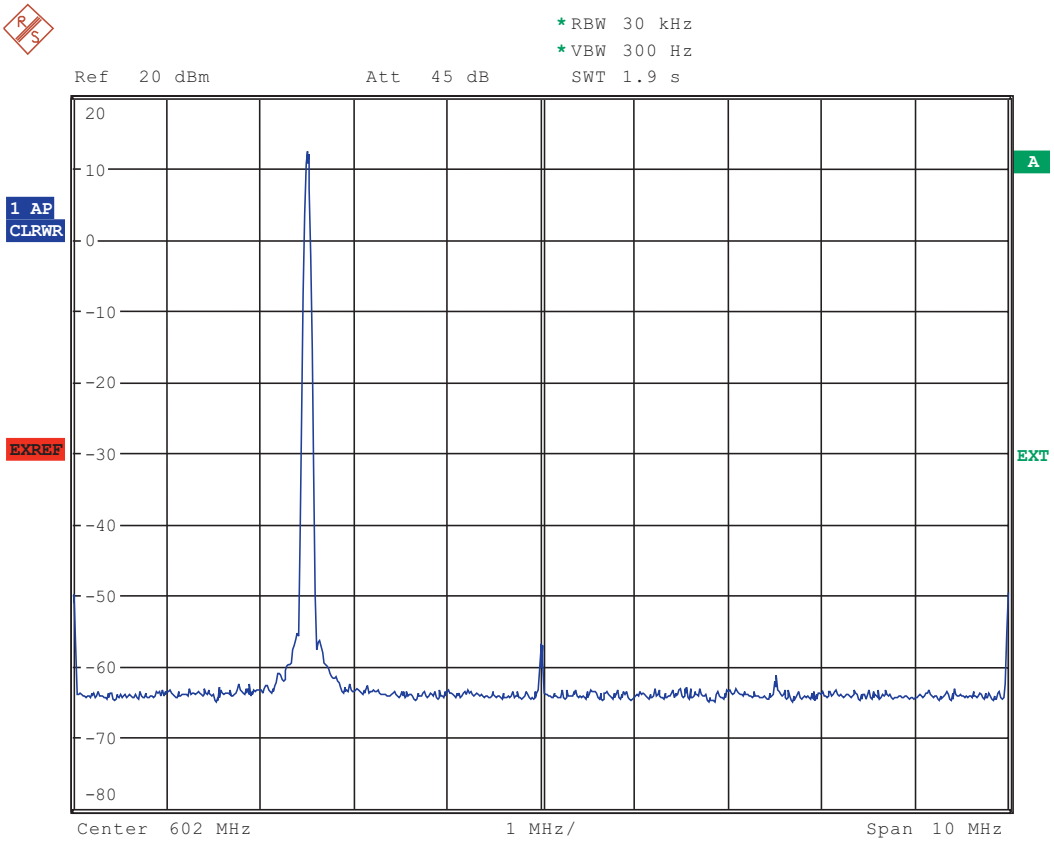


Fig. 2 *Spectrum analyzer display after the adjustment*

6. Use the **I/Q Test Signal** switch to turn the test signal back off.

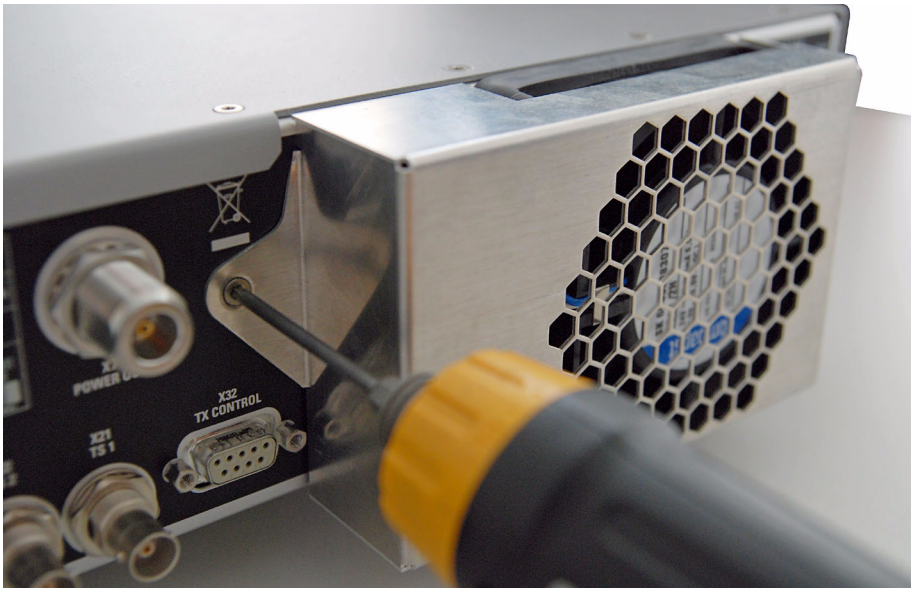
5 Replacing Fan

WARNING!
For safety reasons, the transmitter must be disconnected from the power supply while the fan is being replaced.

5.1 Removing Fan

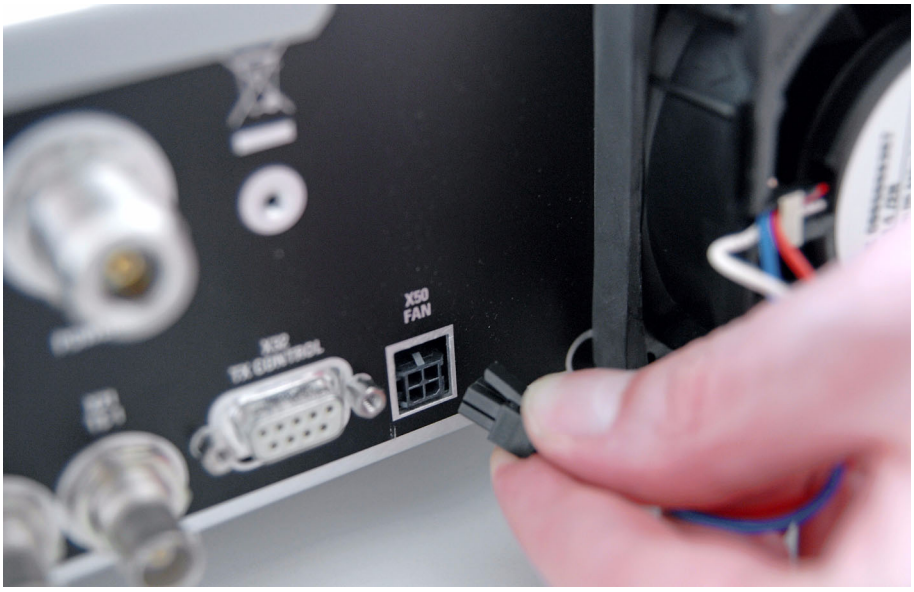
1. Loosen and remove the screw from the fan cover.

   The fan cover is then only held in place by two tabs on the right-hand side.

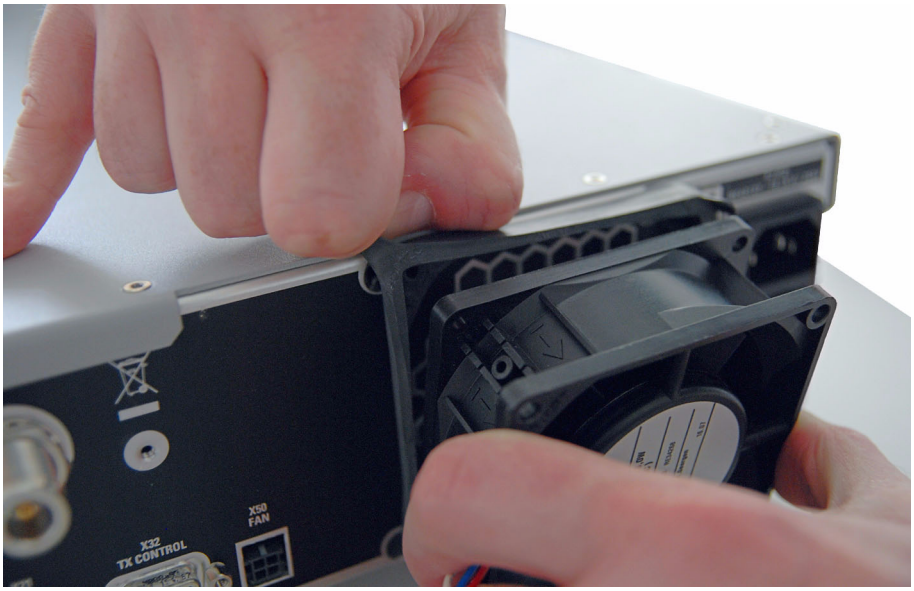


2. Swing the fan cover out to the right and remove.

3. Press the catch on the connector (**X50**, **FAN** socket) and disconnect the power supply cable from the transmitter.

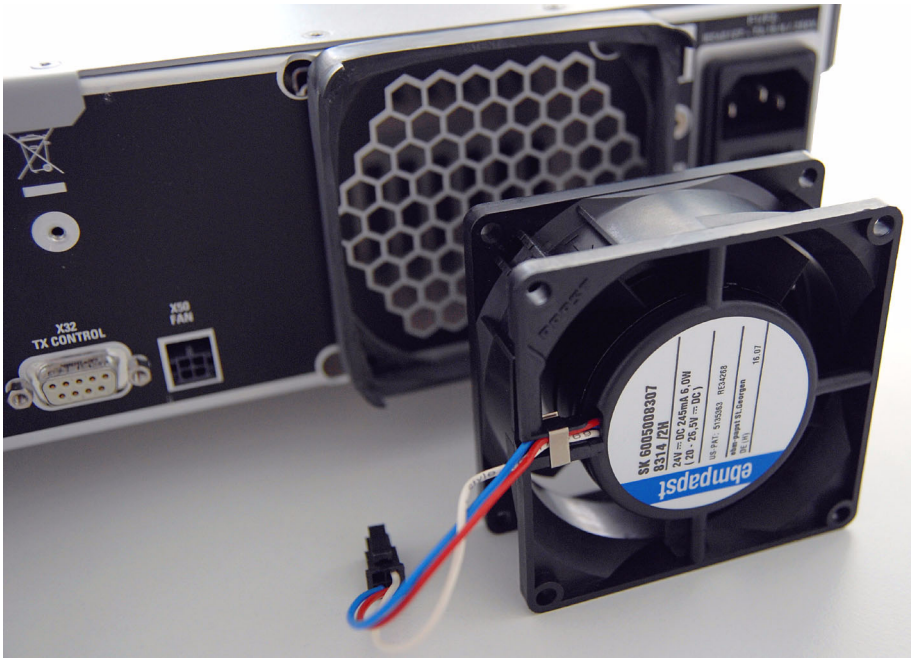


4. Grip the fan shroud at one corner and stretch until the fan can be removed.



5. Remove the fan.

5.2 Installing Fan



1. Grip the fan shroud at one corner and stretch until the replacement fan can be inserted.
2. Insert the fan so that the type plate faces outward and the power supply cable is at the bottom left.

   In this installation position, the fan extracts air from the inside of the device (the black arrow on the side of the fan must point toward the outside).

3. Connect the fan to the power supply socket **X50** (**FAN**).

4. Insert the two tabs on the fan cover (right-hand side) into the recesses on the rear panel of the device and swing the fan cover closed so that it is flush with the rear panel.

   When doing so, make sure that the power supply cable does not protrude from the side of the cover. Do not allow the cable to be pinched.

5. If there are error messages, reset them using the **Reset Fault** context command.

CHAPTER 7

TROUBLESHOOTING

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1 Information 1

1 Information

Troubleshooting information will be provided at a later date.

CHAPTER 8

SERVICE

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CONTENTS

1 Information 1

1 Information

The inside of the exciter does not contain any parts that can be repaired by the customer.

CHAPTER 9

ANNEX

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Interface Description

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1 Interface Description

1.1 Rear-Panel Interfaces

1.1.1 Power Feed / Cooling

1.1.1.1 X8: Power Feed

Rubber-type connector

Variants 20/21 (2 W DTV / 5 W DTV /10 W DTV)

Signal name	Direction	Value range	Contact	Remarks[1)]
L1	Input	90 V AC to 265 V AC I ≤ 2.3 A 50 Hz to 60 Hz ±10%	X8.L	AC power supply
N	Input		X8.N	AC power supply
PE	Input		X8.PE	AC power supply

1) Max. 180 VA

Variant 30 (50 W DTV / 100 W DTV)

Signal name	Direction	Value range	Contact	Remarks [1)]
L1	Input	90 V AC to 265 V AC I ≤ 9.0 A 50 Hz to 60 Hz ±10%	X8.L	AC power supply
N	Input		X8.N	AC power supply
PE	Input		X8.PE	AC power supply

1) Max. 735 VA (100 W DTV)

Variant 31 (125 W ATV / 250 W ATV)

Signal name	Direction	Value range	Contact	Remarks [1]
L1	Input	90 VAC[2] to 265 VAC I ≤ 9.3 A 50 Hz to 60 Hz ±10%	X8.L	AC power supply
N	Input		X8.N	AC power supply
PE	Input		X8.PE	AC power supply

1) Max. 840 VA
2) 100 V for 250 W ATV

1.1.1.2 X50: Fan Supply

Molex, male connector (4-contact)

Signal name	Direction	Value range	Contact	Remarks
VCC_FAN	Output	+20 V DC to 24 V DC	X50.1	
VCC_GND	Bidirect.	0 V	X50.2	
FAN_SPEED	Input	Open collector	X50.3	
NC			X50.4	

1.1.2 Control Interfaces

1.1.2.3 ETHERNET REMOTE (X31): Control Interface for Remote Operation

RJ45, female connector (8-contact)

Signal name	Direction	Value range	Contact	Remarks
TD+	Output	Ethernet	X31.1	
TD-	Output	Ethernet	X31.2	
RD+	Input	Ethernet	X31.3	
NC			X31.4	
NC			X31.5	
RD-	Input	Ethernet	X31.6	

Signal name	Direction	Value range	Contact	Remarks
NC			X31.7	
NC			X31.8	

1.1.2.4 ETHERNET LOCAL (X30): Control Interface for Local Operation

RJ45, female connector (8-contact)

Signal name	Direction	Value range	Contact	Remarks
TX+	Output	Ethernet	X30.1	
TX-	Output	Ethernet	X30.2	
RX+	Input	Ethernet	X30.3	
NC			X30.4	
NC			X30.5	
RX-	Input	Ethernet	X30.6	
NC			X30.7	
NC			X30.8	

1.1.2.5 TX CONTROL (X32): Interlock Loop, CAN Bus

D-Sub, female connector (9-contact)

Signal name	Direction	Value range	Contact	Remarks
+12 V	Output	+12 V +0.5/-1.5 V	X32.1	Power supply for external modules (max. 0.5 A)
+12 V	Output	+12 V +0.5/-1.5 V	X32.9	
GND	Bidirect.	0 V	X32.3	
GND	Bidirect.	0 V	X32.6	
CAN_L	Bidirect.	–	X32.2	CAN bus
CAN_H	Bidirect.	–	X32.7	CAN bus
RF_LOOP_P	Output	–	X32.8	Optocoupler
RF_LOOP_N	Bidirect.	0 V floating	X32.4	Ground
+12V_PF	Output	+12 V floating	X32.5	Ri = 1 kΩ (for diagnosis)

1.1.3 POWER OUT (X7): RF Output

N female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
Power out	Output	For power outputs of variants, refer to power output table in chapter "Design and Function"	X7.1	RF output Ri = 50 Ω
GND	Bidirect.	0 V	X7.2	

1.1.4 Reference Interfaces

1.1.4.6 EXT 1 PPS (X23): Seconds Pulse from External GPS

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
EXT 1 PPS	Input	LVT	X23.1	Ri = 50 Ω for AC
GND	Bidirect.	0 V	X23.2	

1.1.4.7 EXT REF (X24): Reference Input

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
EXT REF	Input	-5 dBm to 20 dBm or LVT	X24.1	Reference input for 5 MHz or 10 MHz Ri = 50 Ω for AC
GND	Bidirect.	0 V	X24.2	

1.1.4.8 REF OUT (X29): Reference Monitoring

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
REF OUT	Output	350 mV pp to 450 mV pp	X29.1	Reference frequency or 1 PPS[1)] (for monitoring only) Ri = 50 Ω
GND	Bidirect.		X29.2	

1) Can be selected using software

1.1.5 DTV Input Interfaces

1.1.5.9 TS 1 (X21): Signal Input 1 (also HP stream)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
TS1	Input	ASI / SMPTE310M	X21.1	Ri = 75 Ω
GND	Bidirect.	0 V	X21.2	

1.1.5.10 TS 2 (X22): Signal Input 2 (also LP stream)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
TS2	Input	ASI / SMPTE310M	X22.1	Ri = 75 Ω
GND	Bidirect.	0 V	X22.2	

1.1.6 ATV Input Interfaces

1.1.6.11 AUDIO 1 (X27): Analog Audio Input AF1

XLR, female connector

Signal name	Direction	Value range	Contact	Remarks
AF1-	Input	-12 dBu to +12 dBu	X27.1	Ri = 600 Ω / > 10 kΩ
AF1+	Input		X27.2	
GND	Bidirect.	0 V	X27.3	
GND	Bidirect.	0 V	X27.4	

1.1.6.12 AUDIO 2 (X28): Analog Audio Input AF2

XLR, female connector

Signal name	Direction	Value range	Contact	Remarks
AF2-	Input	-12 dBu to +12 dBu	X28.1	Ri = 600 Ω / > 10 kΩ
AF2+	Input		X28.2	
GND	Bidirect.	0 V	X28.3	
GND	Bidirect.	0 V	X28.4	

1.1.6.13 BTSC (X25): Analog Audio Input to BTSC Standard (M, N)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
BTSC	Input	0.25 Vrms to 2 Vrms	X25.1	Ri = 75 Ω
GND	Bidirect.	0 V	X25.2	

1.1.6.14 VF (X20): Analog Video Input

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
VF	Input	0.7/1 V pp ±3 dB	X20.1	Ri = 75 Ω
GND	Bidirect.	0 V	X20.2	

1.1.6.15 NICAM DATA (X26): Digital Data Input NICAM 728

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
NICAM DATA	Input	1 V pp to 10 V pp	X26.1	Ri = 50 Ω for AC
GND	Bidirect.	0 V	X26.2	

1.1.7 Interfaces for Options

1.1.7.16 RECEIVER (X1): Antenna Input for DVB-T Receiver

N female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RECEIVER	Input		X1.1	Retransmitter Ri = 50 Ω
GND	Bidirect.	0 V	X1.2	

1.1.7.17 RECEIVER AUX (X3): Second Antenna Input for DVB-T Receiver

N female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RECEIVER AUX	Input		X3.1	Diversity reception Ri = 50 Ω

Signal name	Direction	Value range	Contact	Remarks
GND	Bidirect.	0 V	X3.2	

1.1.7.18 GPS ANTENNA (X2): Antenna Input for GPS Receiver

N female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
GPS ANTENNA	Input	Minimum level: -128 dBm	X2.1	Ri = 50 Ω
GND	Bidirect.	0 V	X2.2	

1.2 Front-Panel Interface

1.2.1 RF MONITOR (X4): RF Test Output

SMA, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RF MONITOR	Output	For monitoring amplifier output Attenuation approx. 33 dB	X4.1	Ri = 50 Ω
GND	Bidirect.		X4.2	

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